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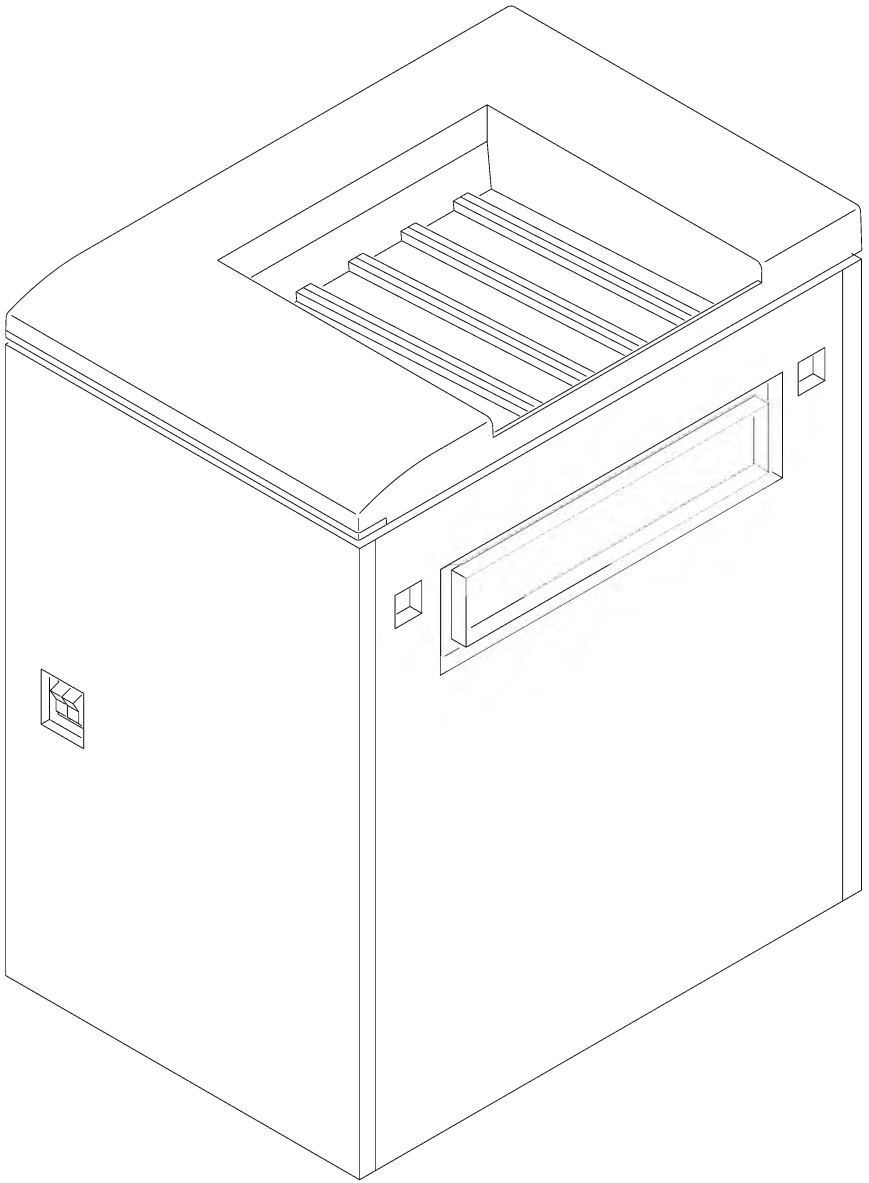
THEORY GUIDE for the *Kodak X-Omat* 180 LP and 180 LPS PROCESSORS



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Section 1: PROCESSOR Description

Introduction

The *Kodak X-Omat 180 LP* PROCESSOR is a self-threading, roller-type film PROCESSOR designed for use with the *Kodak Ektascan* 2180 LASER PRINTER to process x-ray film. The 180 LP PROCESSOR uses a single-speed AC motor and has four racks: developer, fixer, wash, and dryer. The film transport speed of the PROCESSOR is160 cm (63 in.) per minute.

The 180 LP PROCESSOR is not available as a stand-alone model; it is intended to be a semi-integral part of the 2180 LASER PRINTER. The LASER PRINTER can operate without a 180 LP PROCESSOR, but the 180 LP PROCESSOR must be connected to a 2180 LASER PRINTER to operate.

The 180 LP PROCESSOR functions are controlled by a MICROPROCESSOR CIRCUIT BOARD. Diagnostics can be run from an IBM-compatible PORTABLE COMPUTER connected to a plug on the ELECTRICAL BOX in the PROCESSOR and can also be coupled through an RS232 port with a special harness. The operator communicates with the PROCESSOR via the CONTROL PANEL on the LASER PRINTER.

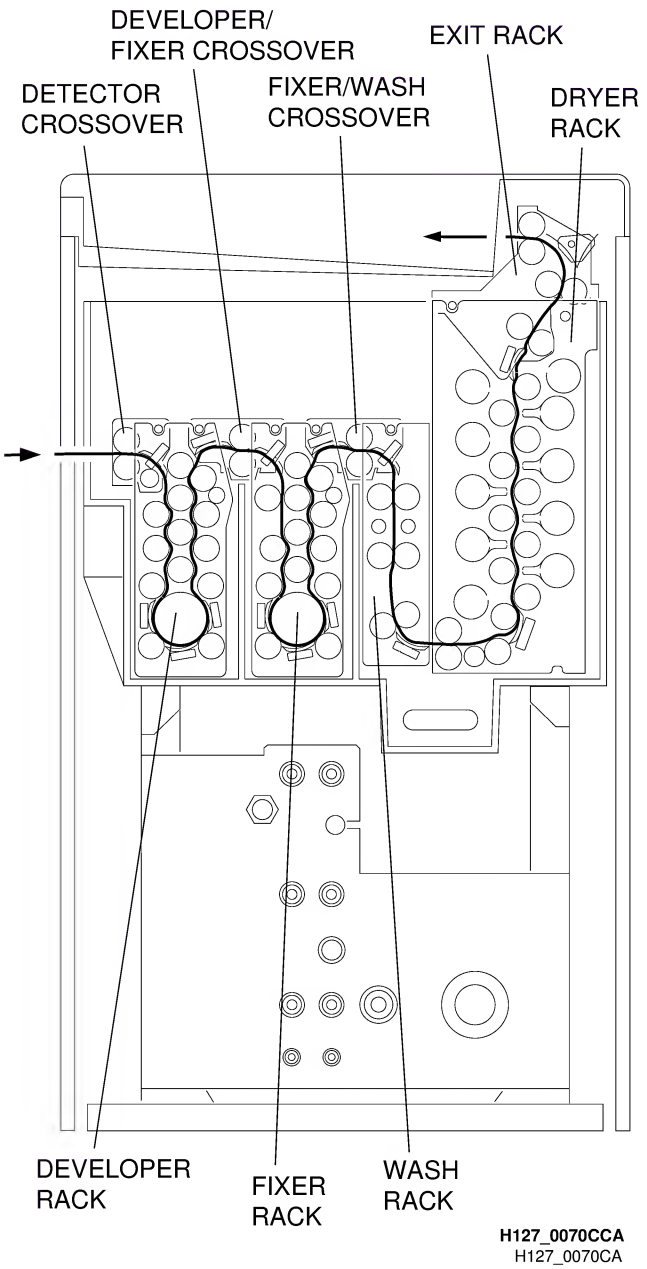
The PROCESSOR has independent REPLENISHMENT PUMPS for developer and fixer that replenish on the basis of film area as determined by the LASER PRINTER using RS232 communications. The pumping rate for each pump is fixed; the length of time the PUMP operates controls the volume per unit of film area.

The MICROPROCESSOR CIRCUIT BOARD automatically adjusts replenishment to compensate for film usage, as well as control the operating parameters of the PROCESSOR.

Kodak RP CHEMICALS are recommended for x-ray film processing.

The *Kodak X-Omat* 180 LPS PROCESSOR is a 180 LP PROCESSOR with a *Kodak X-Omat 180 SORTER installed at the factory. For specific information on the SORTER, see the SORTER section at the back of this Binder.*

PROCESSOR Operation



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The PROCESSOR receives film from the LASER PRINTER. The film is transported through the PROCESSOR by a network of motor-driven ROLLERS, the film transport assembly.

The film travels through 2 chemical TANKS and a wash system that apply the following solutions:

[1] Developer

This solution converts the invisible latent image on the film to a visible image.

[2] Fixer

This solution stops the continued development of the visible image by removing unused silver halide crystals from the film. The RP fixer also increases the permanency of the visible image by hardening the emulsion.

[3] Water

The wash water removes all excess fixer from the film, which prepares the film for drying. This ensures a permanent image on the film.

After exiting the WASH RACK, the film is transported through a DRYER. In the DRYER, a BLOWER circulates warm air across the surface of the film. The dry, processed film then exits the PROCESSOR through an EXIT RACK onto the TOP COVER.

The 180 LP and 180 LPS PROCESSORS are controlled by an internal General Purpose Micro Controller Circuit Board (GPMC 500 CIRCUIT BOARD). The PROCESSOR receives its instructions by communicating with the LASER PRINTER. The PROCESSOR stores this information in RAM, which has a battery backup feature, and then controls the temperatures. If the PROCESSOR is energized when it is disconnected from the LASER PRINTER, the PROCESSOR continues to maintain all temperatures at the value last sent by the LASER PRINTER.

Note

The LASER PRINTER displays the current setpoint values for the PROCESSOR; these values are the factory default values unless the customer has modified the setpoints. The PROCESSOR defaults are preset at the factory. To modify the setpoint values, enter a 4-digit access code, 4213.

While the film moves through the chemical TANKS, the PROCESSOR controls several functions to create optimum processing conditions in the TANKS:

- **Maintaining the Correct Temperature of the Developer and Fixer**

  This function is accomplished by controlling the developer HEATER and fixer HEATER. The HEATERS are located inside the developer and fixer THERMOWELLS. The heater THERMISTORS sense the temperature of the developer and fixer in the THERMOWELLS.

- **Cooling the Developer**

  This function is accomplished by energizing 2 SOLENOIDS: the WASH WATER SOLENOID and the DEVELOPER COOLING SOLENOID. When the WASH WATER SOLENOID opens, water is supplied to the WASH RACK. The water collects around a HEAT EXCHANGER at the bottom of the WASH TANK. When the DEVELOPER COOLING SOLENOID energizes, developer flows through the HEAT EXCHANGER. The cooler water surrounding the HEAT EXCHANGER effectively cools the developer solution.

- **Replenishing the Developer and Fixer TANKS**

  The LASER PRINTER sends film area information to the PROCESSOR. The developer and fixer REPLENISHMENT PUMPS activate each time the LASER PRINTER sends 238 sq in. (35 x 43 cm) of film to the PROCESSOR. The operator can specify the amount of solution added to the TANKS during each replenishment cycle. You'll need to connect with external replenisher tanks or an automixer to the PROCESSOR to supply the developer and fixer solutions.

- **Maintaining the Correct Temperature in the DRYER**

  This function is accomplished by energizing a BLOWER MOTOR and an air HEATER to circulate warm air across the surface of the film. A DRYER THERMISTOR senses the temperature of the air in the DRYER. The PROCESSOR also includes a safety THERMOSTAT, that can be reset manually, to sense abnormal temperatures and to shut off the HEATER.

- **Transporting the Film through the PROCESSOR**

  This function is accomplished by energizing the main DRIVE MOTOR. The DRIVE MOTOR drives the ROLLERS that transport the film from the entrance, through the PROCESSOR, and to the exit.

- **Diagnostic Features**

  The PROCESSOR also includes software that allows it to interface with an IBM-compatible PORTABLE COMPUTER. This feature increases diagnostic capabilities and allows quick updating of the software in the PROCESSOR. With the PORTABLE COMPUTER, new software can be downloaded directly into the PROCESSOR, rather than having to install new memory chips in the PROCESSOR.

Section 2: System Initialization

Start-Up Sequence

To apply power to the 180 LP or 180 LPS PROCESSOR, press the MAIN CIRCUIT BREAKER located on the front PANEL. The PROCESSOR should be energized 20 minutes before the 2180 LASER PRINTER is energized to allow solutions to reach operating temperatures. (If an operator requests that an image be printed before the chemicals in the PROCESSOR have reached the correct temperature, the image is kept in the queue of the LASER PRINTER until the PROCESSOR becomes ready.)

When power is applied, or the PROCESSOR is reset, the software checks the setup and operation of the PROCESSOR. The system initializes variables, I/O ports, and serial communications ports.

The initialization begins with a self-check to verify correct operation of the PROCESSOR. The self-check verifies the following:

- operation of the internal RAM and external RAM
- checksum of the main program EEPROM
- checksum of the bootstrap PROM
- operation of external input/output devices

If the self-check locates an error, the PROCESSOR tries to send a fatal E001 error to the LASER PRINTER. Depending on the failure, the message may not be transmitted. If the self-check is successful, the initialization continues and the PROCESSOR:

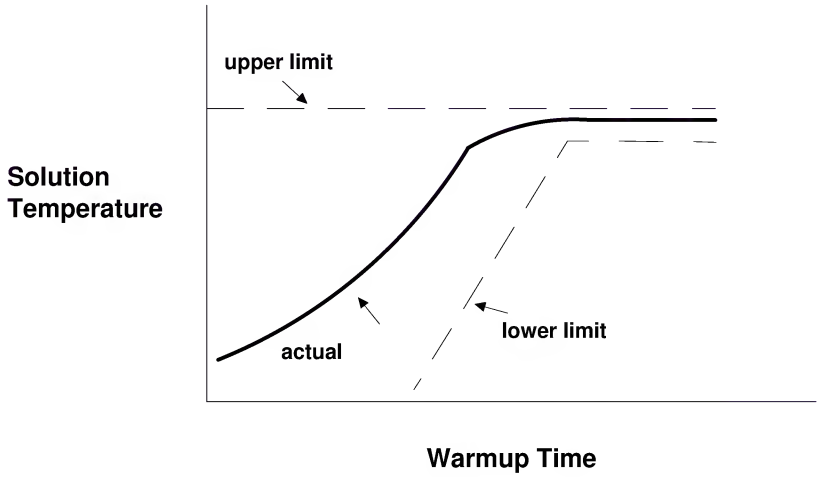
1. energizes the WASH WATER SOLENOID, allowing water to flow into the PROCESSOR.
2. energizes the DRYER BLOWER and air HEATER.
3. checks the developer and fixer solution levels. If the levels are not correct, the replenishment cycle activates and the TANKS are filled. If the solution does not reach the correct level within 4 minutes, a tank-fill error occurs.
4. energizes the RECIRCULATION PUMP after the solutions reach their operating levels. This circulates the developer and fixer solutions through the THERMOWELLS where they are heated, if necessary. If the temperature increases too slowly, an error condition occurs.

The MICROPROCESSOR uses algorithms and controls to monitor the temperature of the solutions. The temperatures should increase at a certain rate within 15 - 20 minutes. The chart on the next page illustrates the correct relationship between temperature and time.

If the initialization sequence is completed successfully, the PROCESSOR displays a “Ready” message on the CONTROL PANEL of the LASER PRINTER.

Note

The status LED DS7, located on the 500 CIRCUIT BOARD, flashes on and off at $^1/_2$-second intervals when the software is operating correctly.



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Section 3: Film Transport

Film Detection

After the initialization sequence is complete, the PROCESSOR sends a signal to the LASER PRINTER indicating that it is ready to accept film. When the LASER PRINTER has a sheet of film ready to be processed, it communicates the size of the film to the PROCESSOR. The PROCESSOR uses this information to determine replenishment amounts. This signal also takes the PROCESSOR out of standby mode.

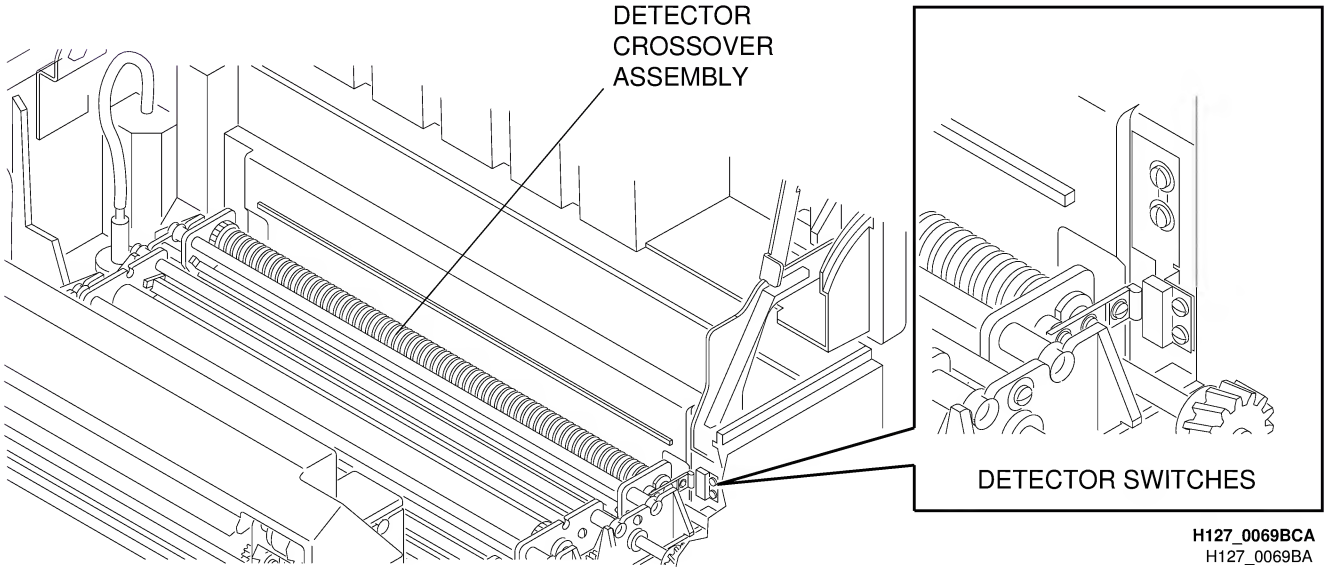
When the PROCESSOR enters the operating mode, the following occurs:

- the main drive actuates
- the WASH WATER SOLENOID energizes, providing water to the WASH RACK
- the DRYER BLOWER and HEATER energize

Note

The WASH WATER SOLENOID does not energize until the leading edge of the film starts to exit the FIXER RACK. This delay conserves water.

The LASER PRINTER then transports the film into the PROCESSOR. The leading edge of the film causes the entrance ROLLERS on the DETECTOR CROSSOVER ASSEMBLY to separate. As the ROLLERS separate, magnets on each end of the ROLLERS actuate one or both of the DETECTOR SWITCHES S1 and S2. These SWITCHES signal the MICROPROCESSOR to indicate that the film has been transported into the PROCESSOR.



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Drive System

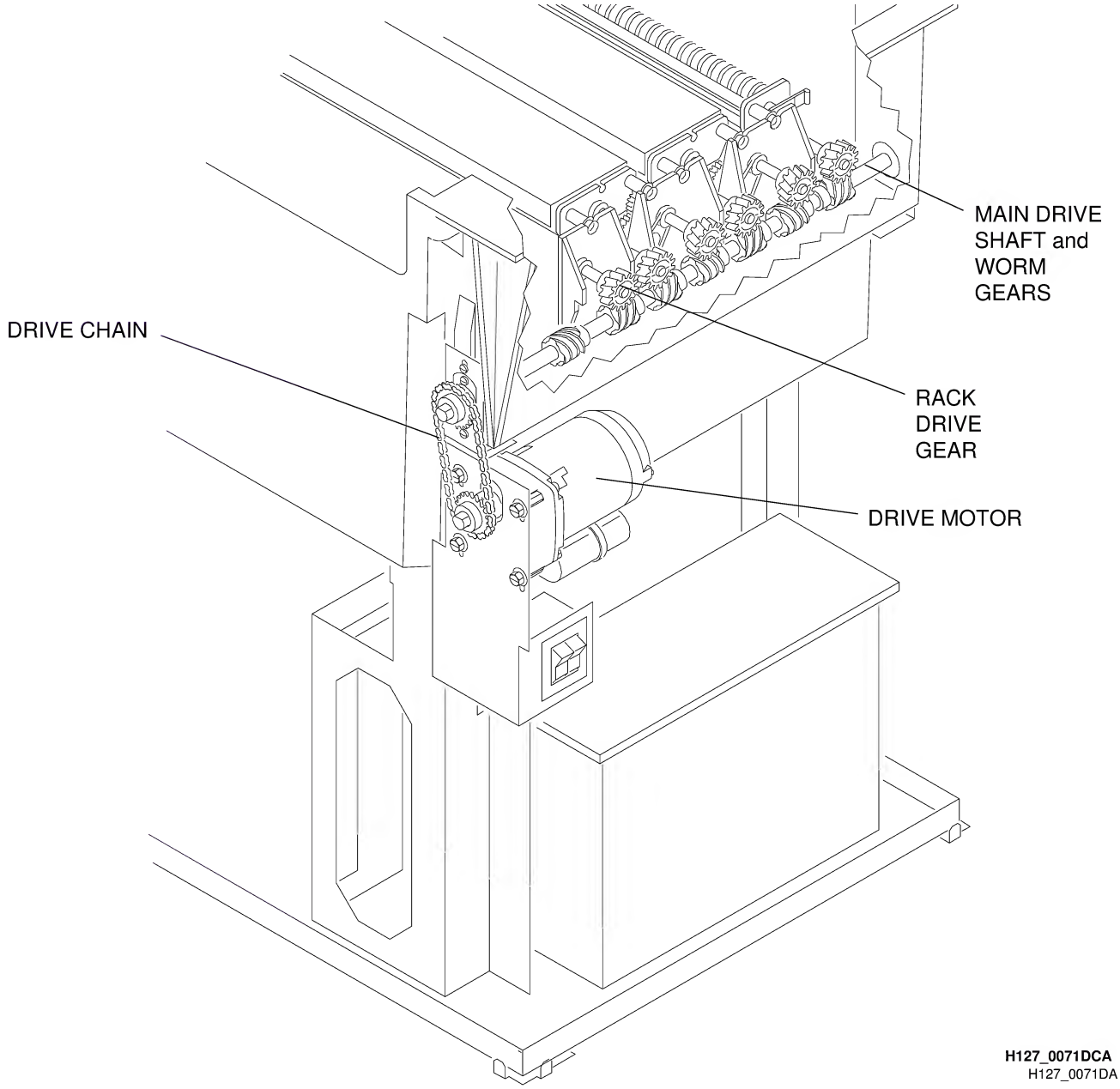
Now that the PROCESSOR has been taken out of standby mode by the LASER PRINTER, the circuit for the drive system activates.

The INTERLOCK SWITCH for the TOP COVER must be enabled before the drive engages. If you open the TOP COVER, the DRIVE MOTOR is disabled and a message is sent to the LASER PRINTER indicating that an error has been detected. The DRIVE MOTOR starts when you close the TOP COVER.

Drive Components

The PROCESSOR uses a single speed AC motor which supplies drive to a network of ROLLERS called the film transport assembly. The drive is provided through a DRIVE CHAIN, SHAFT, and WORM GEARS. Each WORM GEAR then meshes with a DRIVE GEAR on the RACKS in the film transport assembly.

The DRIVE MOTOR automatically resets the thermal overload protection.



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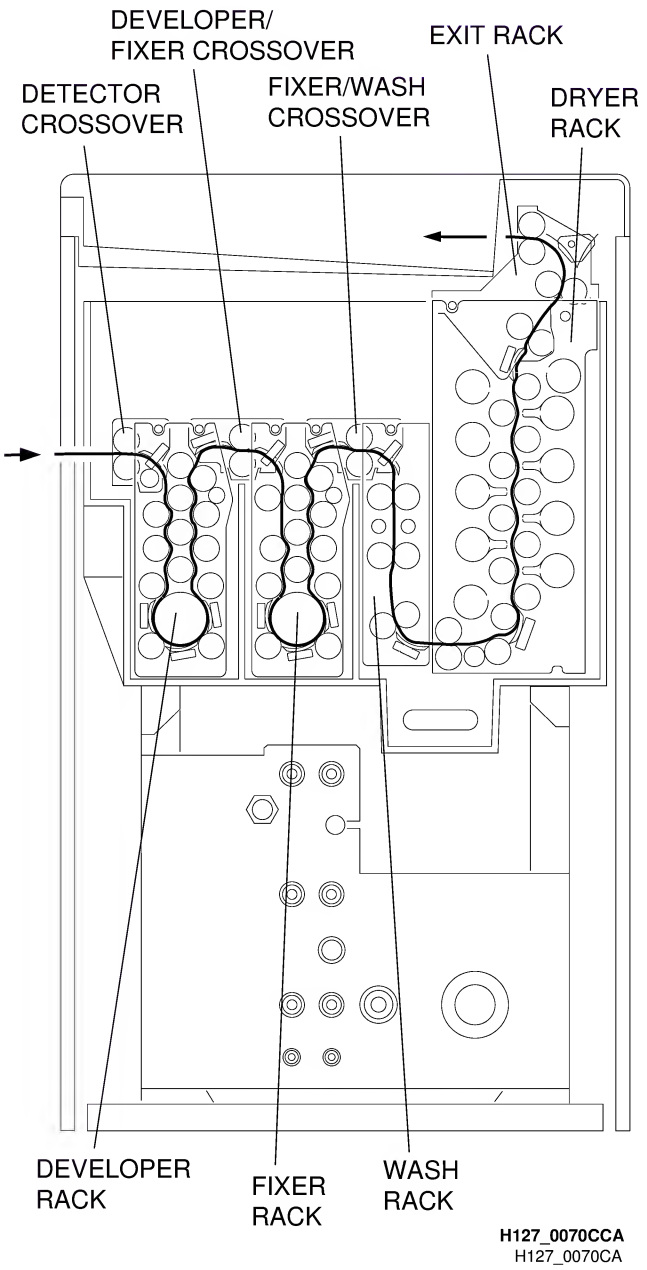
Film Transport Assembly



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With drive supplied to the film transport assembly, the DETECTOR CROSSOVER transports the film into the PROCESSOR.

The film is transported to a DEVELOPER RACK, a FIXER RACK, a WASH RACK, and a DRYER RACK. The RACKS consist of a series of ROLLERS driven by CHAINS and GEARS.

Important

Although the DEVELOPER and FIXER RACKS are similar, they cannot be interchanged. This is especially important to prevent chemical residues from contaminating other solutions. Note the labeled WASHERS at the end of the DEVELOPER RACK, the DEVELOPER/FIXER CROSSOVER, the FIXER RACK, and the FIXER/WASH CROSSOVER to identify them.

Between each RACK is a crossover section that transports the film between RACKS. The pressure applied by the ROLLERS also removes any remaining solutions from the film surface before it enters the next RACK.

When the film leaves the WASH RACK, it passes into the DRYER RACK. Here, SQUEEGEE ROLLERS remove most of the water across the film surface to encourage fast, uniform drying. The ROLLERS in the DRYER then move the film through the EXIT RACK and out of the PROCESSOR into the RECEIVE TRAY.

Drop time is 160 cm/minute or 62.86 in./minute.

Process time is 155 cm/minute or 58 seconds/60.8 in..

Note

Process Time refers to the time it takes the leading edge of a 35 x 43 cm (14 x 17 in.) sheet of film, fed along the 43 cm width, to travel from the DETECTOR CROSSOVER ENTRANCE ROLLERS to the EXIT ROLLERS of the DRYER RACK.

Drop Time refers to the time from when the leading edge of a 35 x 43 cm (14 x 17 in.) sheet of film, fed along the 43 cm width, enters the DETECTOR CROSSOVER ENTRANCE ROLLERS and the trailing edge exits the DRYER RACK.

Section 4: Processing

Overview

As the film moves through the film transport assembly, the film passes through several TANKS where the film is processed. The processing procedure involves 4 different stages. This section describes these stages and how they are controlled.

DEVELOPER TANK

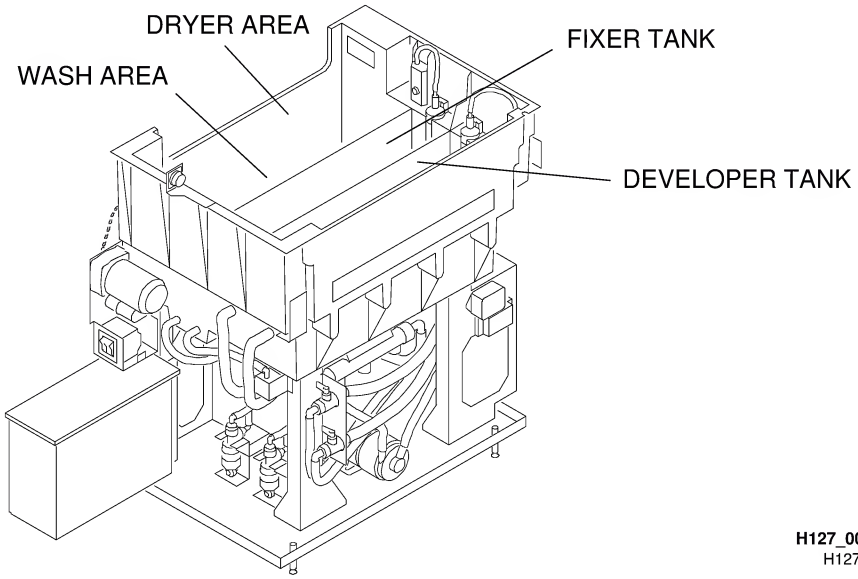
The film enters the DEVELOPER TANK first. In this TANK, a developer solution converts the invisible latent image on the film to a visible image.

The TANK contains approximately $8^1/_2$ litres ($2^1/_4$ gal.) of developer solution. The solution in an external tank or automixer automatically supplies fresh developer solution to the DEVELOPER TANK. For more information about replenishment, see Page 32.

Developer Recirculation

The developer RECIRCULATION PUMP circulates the developer solution continuously through a THERMOWELL where it is heated when necessary. The developer solution also passes through a FILTER.

The developer RECIRCULATION PUMP is magnetically coupled with the motor. The developer and fixer RECIRCULATION PUMPS use the same motor.



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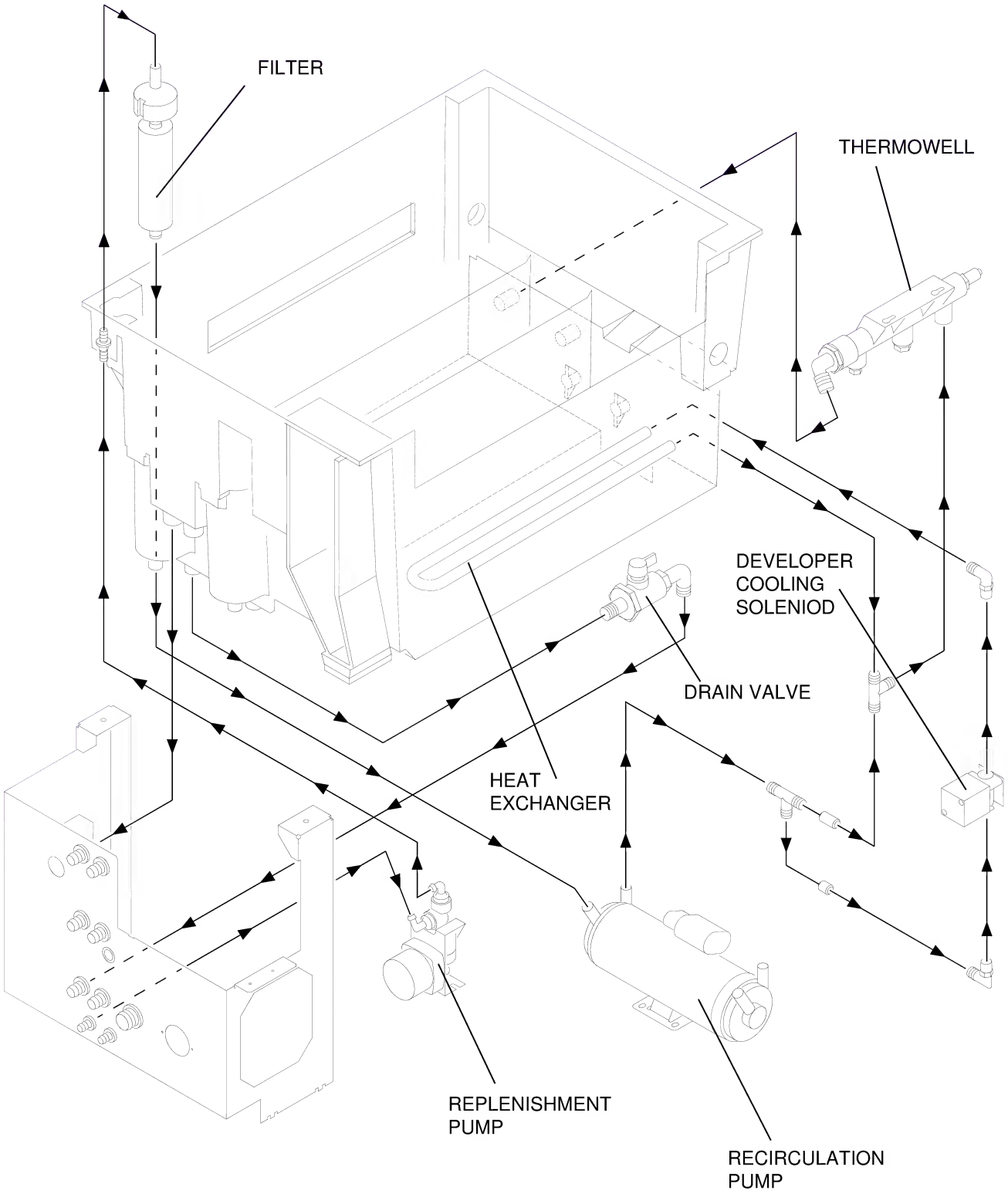
Developer Plumbing Diagram



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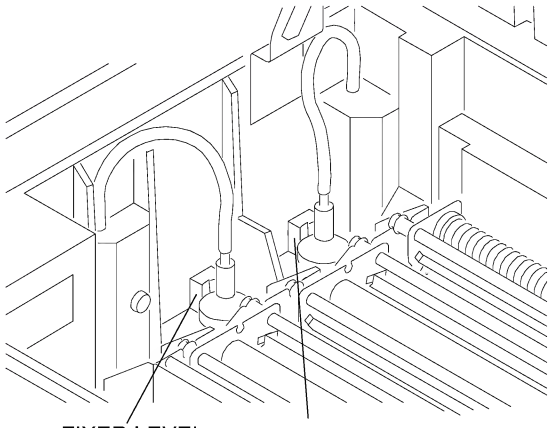
Developer Level Detection

- If the LEVEL PROBE is not immersed in developer solution for 10 consecutive readings (approximately 5 seconds), the solution level is considered to be low.
- If the LEVEL PROBE is immersed in solution, the developer solution is considered to be at the operating level.

Note

The LEVEL PROBE does not function properly if the TANK is filled with water instead of developer, because water does not have the same conductivity as the developer solution.



Recirculation takes place only when both the DEVELOPER and FIXER TANKS are full. A PROBE in the level sensing reservoir detects a full condition.

When the TANK is full, the solution covers the developer LEVEL PROBE, providing a path to ground on the developer HEATER case. This lowers the resistance of the circuit. The MICROPROCESSOR, which monitors the circuit, detects the lowered resistance and determines a full solution level. When the TANK is not full enough to cover the PROBE, the resistance of the circuit is higher. The MICROPROCESSOR detects the high resistance and determines a low level condition.

Developer Recirculation Control Circuit

A diagram of the circuit appears on the next page. For more detailed circuit information, see the AC and DC circuit diagrams in the Diagrams for the *Kodak X-Omat* 180 LP and 180 LPS PROCESSORS, Publication No. 1C7841.

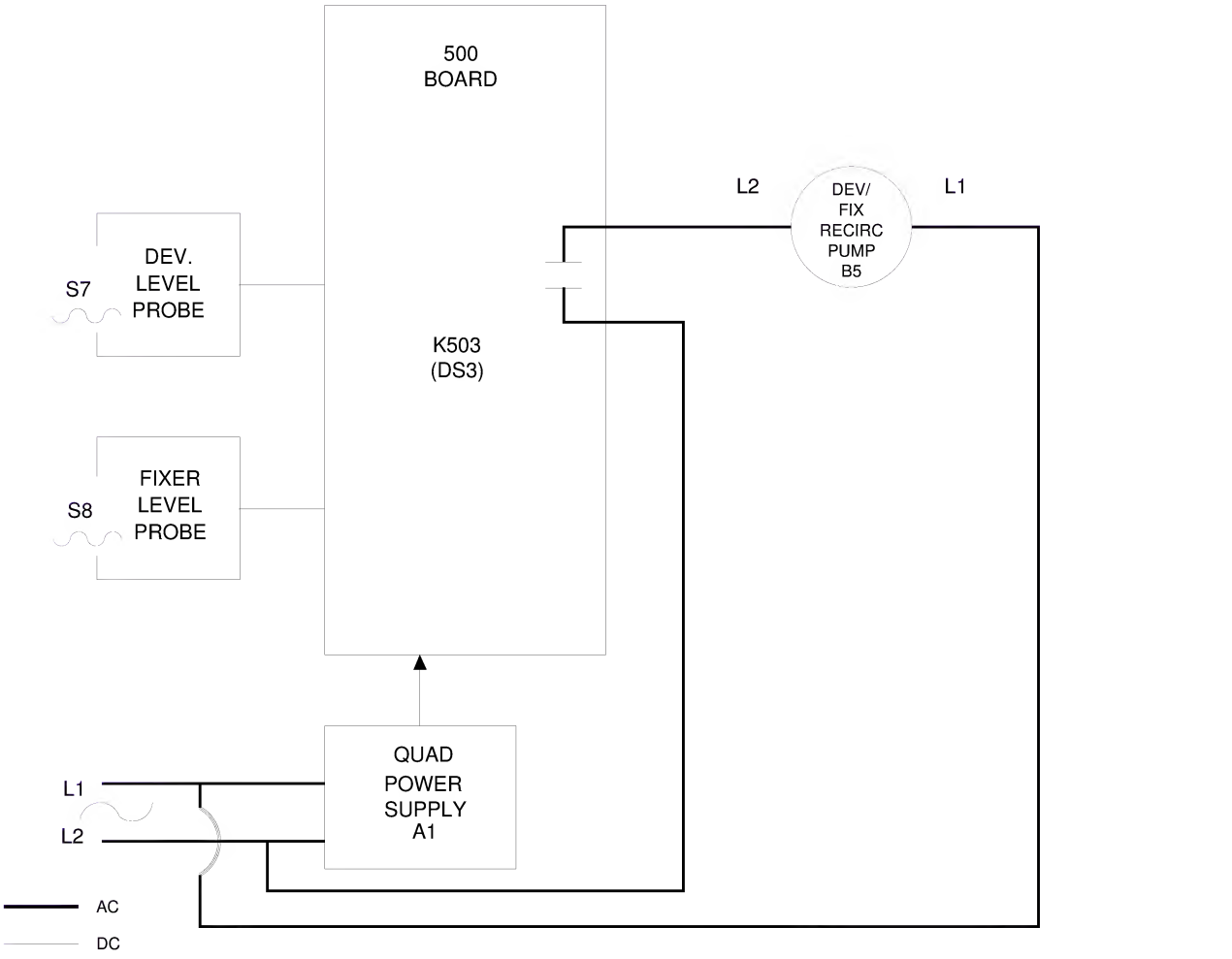
Before recirculation can begin, the levels of the developer and fixer solutions in the TANKS must be high enough to immerse both the developer and fixer LEVEL PROBES in solution, providing a path to ground.

If the solution levels are correct and power is applied to the PROCESSOR, the MICROPROCESSOR energizes the recirculation RELAY K503 (and LED DS3), which provides power to the developer RECIRCULATION PUMP, causing it to energize and recirculate the developer.

Note

- When a RELAY is energized, the corresponding LED on the 500 CIRCUIT BOARD also energizes.
- RELAYS that are designated with a K5 (for example, K501) are electromechanical RELAYS, which are mounted on the 500 CIRCUIT BOARD. RELAYS that are designated with SSR (for example, SSR U3) are SOLID STATE RELAYS and are mounted on the wall of the ELECTRICAL BOX.

BLOCK DIAGRAM
DEVELOPER/FIXER RECIRCULATION CONTROL



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Developer Temperature Control

Monitoring the Temperature. While the developer is recirculating, a THERMISTOR in the THERMOWELL monitors the temperature of the solution. The resistance of the THERMISTOR changes inversely with the temperature of the solution. This data is sent to the MICROPROCESSOR, which controls the heating and cooling systems. For more information about the control circuitry of the THERMISTOR, see Page 38.

The temperature is determined by performing an analog-to-digital (A/D) conversion on the resistance of the THERMISTOR. This data is then converted to a temperature by means of a software algorithm. The temperature is then compared to the setpoint to determine if heating or cooling is required. The temperature is read approximately every 3/4 second.

The maximum temperature that the A/D is able to measure is approximately 40 C (105 F). If the solution temperataure is greater than 40 C (105 F), Error Code E034 “Unable to Determine Developer Temperature” is reported to the LASER PRINTER.

Heating System. The developer HEATER must be controlled to provide optimum conditions for processing x-ray film. A HEATER, located inside the THERMOWELL, pulses at different duty cycles to maintain the optimum temperature. The MICROPROCESSOR controls the duty cycle of the HEATER based on the data received from the THERMISTOR.

The heating of the developer is controlled by a proportional method, which operates in the following manner:

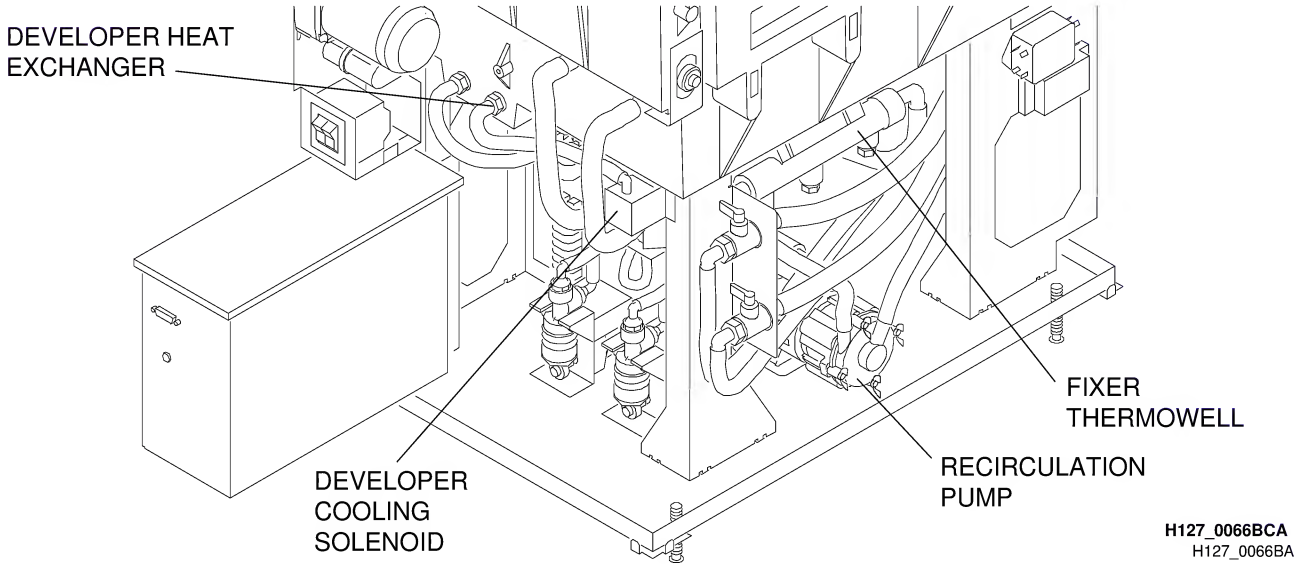
1. The HEATER is turned on full until the temperature of the solution is less than 0.28 C (0.5 F) below the setpoint.
2. The HEATER operates on a duty cycle of approximately 60% until the temperature of the solution is less than 0.17 C (0.3 F) below the setpoint.
3. The HEATER operates on a duty cycle of approximately 40% until the temperature of the solution is less than 0.06 C (0.1 F) below the setpoint.
4. The HEATER operates on a duty cycle of approximaely 20% until the setpoint temperature is reached.
5. When the setpoint temperature is reached, the developer HEATER shuts off.

Cooling System. When the temperature of the developer is 0.17 C (0.3 F) higher than the setpoint for 5 consecutive readings, the cooling system is activated. The WASH WATER SOLENOID L1 must be energized before cooling can start. L1 supplies water to the area around the HEAT EXCHANGER in the bottom of the WASH RACK.

The DEVELOPER COOLING SOLENOID L2 then energizes, allowing some of the developer to circulate through the HEAT EXCHANGER. The water surrounding the HEAT EXCHANGER effectively cools the developer. The cooler developer then returns to the main recirculation line.

The cooling cycle continues until the developer temperature is 0.06 C (0.1 F) below the setpoint for one reading of the developer THERMISTOR. The DEVELOPER COOLING SOLENOID then de-energizes, shutting off the developer supply to the HEAT EXCHANGER.

Temperature Display. The developer temperature is displayed on the DISPLAY SCREEN of the LASER PRINTER when requested by the operator. See the illustration on Page 39.



Temperature Control Errors. The developer heating and cooling systems are responsible for maintaining the developer at the current processing cycle temperature setpoints under all operating conditions. If the developer solution falls outside the acceptable range, and the software cannot correct the temperature within a specified time limit, the PROCESSOR sends a message to the LASER PRINTER indicating that an error has been detected.

The developer solution should stabilize at the setpoint temperature within 20 minutes after energizing the PROCESSOR. If the rate of change for the developer temperature is not within the specifications, the PROCESSOR sends a message to the LASER PRINTER indicating that an error has been detected. The temperature control function checks for the following errors:

1. **Unable to Determine Developer Temperature (E034)**

   If the THERMISTOR or the temperature control A/D converter is not operating correctly, or if the developer termperature is above the range of the A/D (>40 C or 105 F), an error is sent to the LASER PRINTER and displayed on the DISPLAY SCREEN of the LASER PRINTER (if it is the highest priority). This error cannot be cleared unless the PROCESSOR is de-energized and then energized again. For more information about this condition, see the THERMISTOR control section on Page 38.

2. **Loss of Developer Heating Ability (E037) and Loss of Developer Cooling Ability (E038)**

   The rate at which the developer solution is heated and cooled is checked. If the rate is not correct, the appropriate error code is displayed (if this error is the highest priority). These errors are cleared when either the rate corrects itself or the setpoint temperature is reached.

   The cooling rate is checked as long as cooling is needed. The heating rate is checked only when:
   - the developer heater is on full
   - the temperature of the solution is above 28.9 C (84 F)
   - the REPLENISHMENT PUMPS are not energized

Note

- minimum heating rate = an increase of 1.1 C (2.0 F) every 2 minutes
- minimum cooling rate = a decrease of .05 C (0.1 F) every 6 minutes

Developer Temperature Control Circuit. The diagram on the opposite page identifies the main components and the electrical requirements for the developer temperature control circuit. For more detailed circuit information, see the AC and DC circuit diagrams in the Diagrams for the *Kodak X-Omat* 180 LP and 180 LPS PROCESSORS, Publication No. 1C7841.

Note

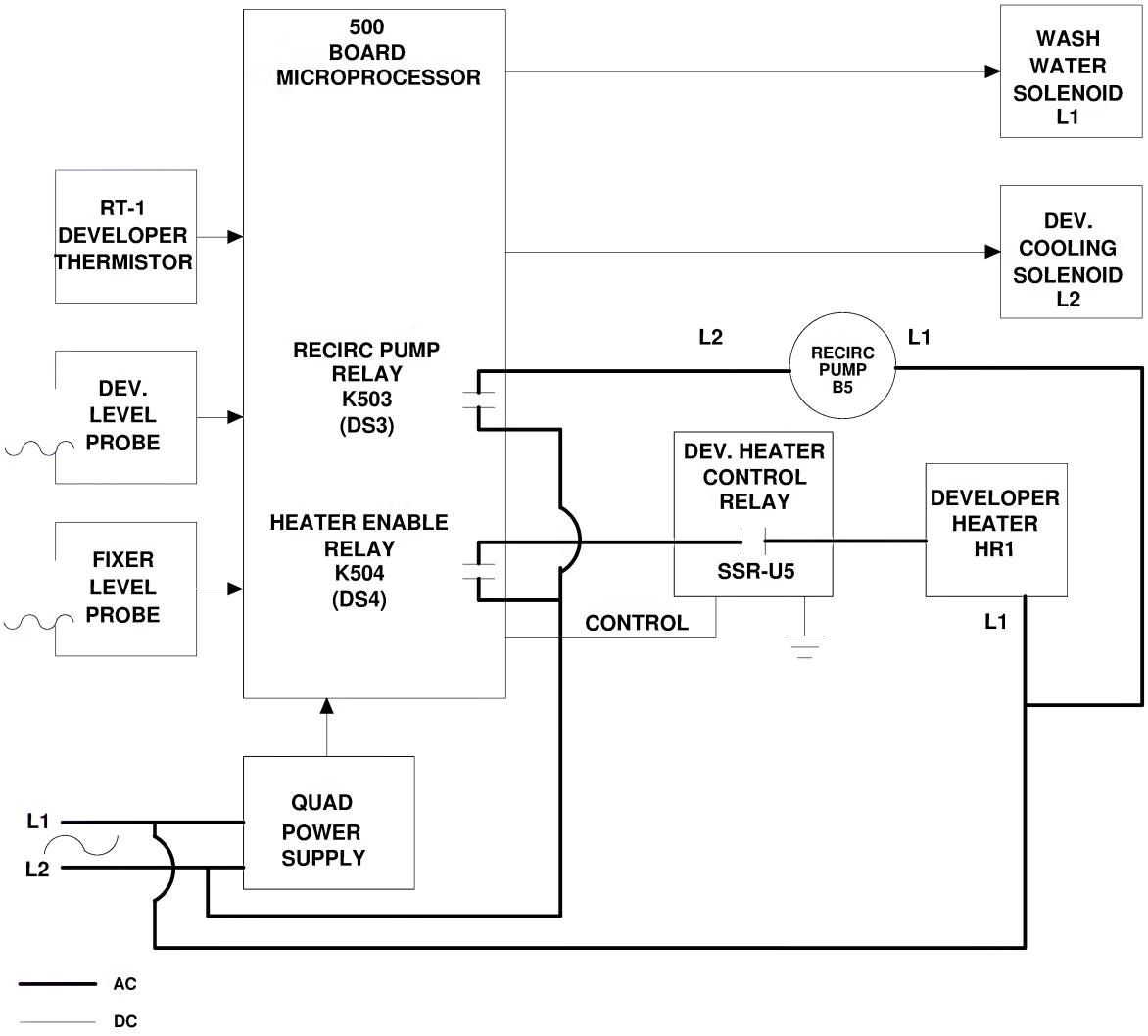
The RECIRCULATION PUMP, the heating circuit, and the cooling circuit do not activate if the DEVELOPER and FIXER TANKS are not full. The developer and fixer LEVEL PROBES inform the MICROPROCESSOR when the TANKS are full. When the TANKS are full, RELAY K503 is energized, turning on the RECIRCULATION PUMP, and the heater enable RELAY K504 is energized. Then the MICROPROCESSOR reacts to the temperature input received from the developer THERMISTOR.

- **If the temperature is below the setpoint**, the MICROPROCESSOR applies DC voltage to the developer heater control U5 RELAY. When the U5 RELAY energizes, the developer HEATER turns on. The developer HEATER operates continually, but at different duty cycles, depending on the difference between the detected temperature and the setpoint.
- **If the temperature is above the setpoint**, the MICROPROCESSOR turns off the developer HEATER, activates the WASH WATER SOLENOID (if it is not already energized) and the DEVELOPER COOLING SOLENOID. The DEVELOPER COOLING SOLENOID opens the path to the HEAT EXCHANGER in the WASH SECTION, allowing developer to enter the HEAT EXCHANGER and be cooled by the wash water.

- When an enable RELAY energizes, the corresponding LED on the 500 CIRCUIT BOARD also energizes.

- RELAYS that are designated with a K (for example, K501) are electromechanical RELAYS, which are mounted on the 500 CIRCUIT BOARD. RELAYS that are designated with SSR (for example, SSR U3) are SOLID STATE RELAYS and are mounted on the wall of the ELECTRICAL BOX.

BLOCK DIAGRAM
DEVELOPER TEMPERATURE CONTROL



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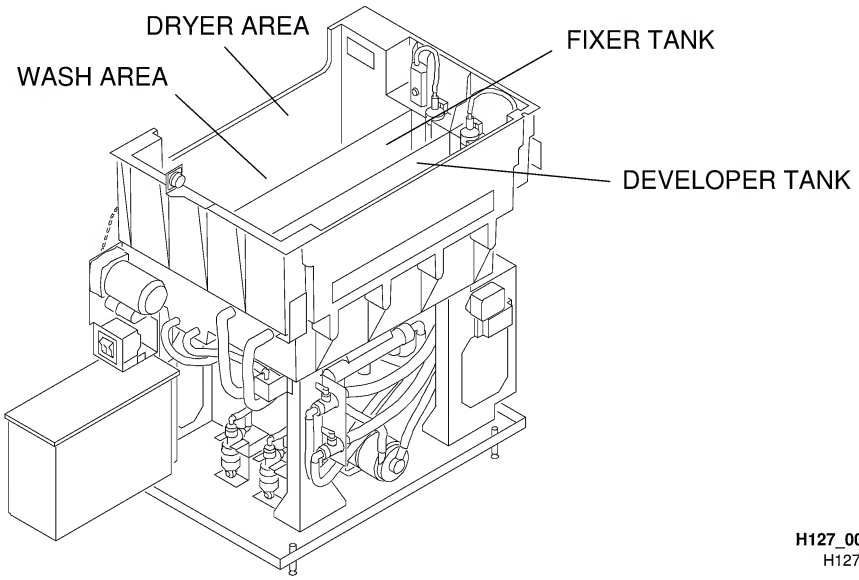
FIXER TANK

After the film is developed, it leaves the DEVELOPER TANK and is transported into the FIXER TANK. This TANK contains fixer solution, which stops the development of the visible image on the film. It also increases the permanency of the visible image by removing unused silver halide crystals from the film.

The FIXER TANK is similar in function to the DEVELOPER TANK. It is both filled and replenished automatically from an external container of fixer solution. For more information about the replenishment cycle, see Page 32.

Fixer Recirculation

Like the developer, fixer is recirculated continuously by a RECIRCULATION PUMP through a THERMOWELL where a THERMISTOR monitors the temperature of the solution. The fixer RECIRCULATION PUMP is magnetically coupled with the same motor as the developer RECIRCULATION PUMP.



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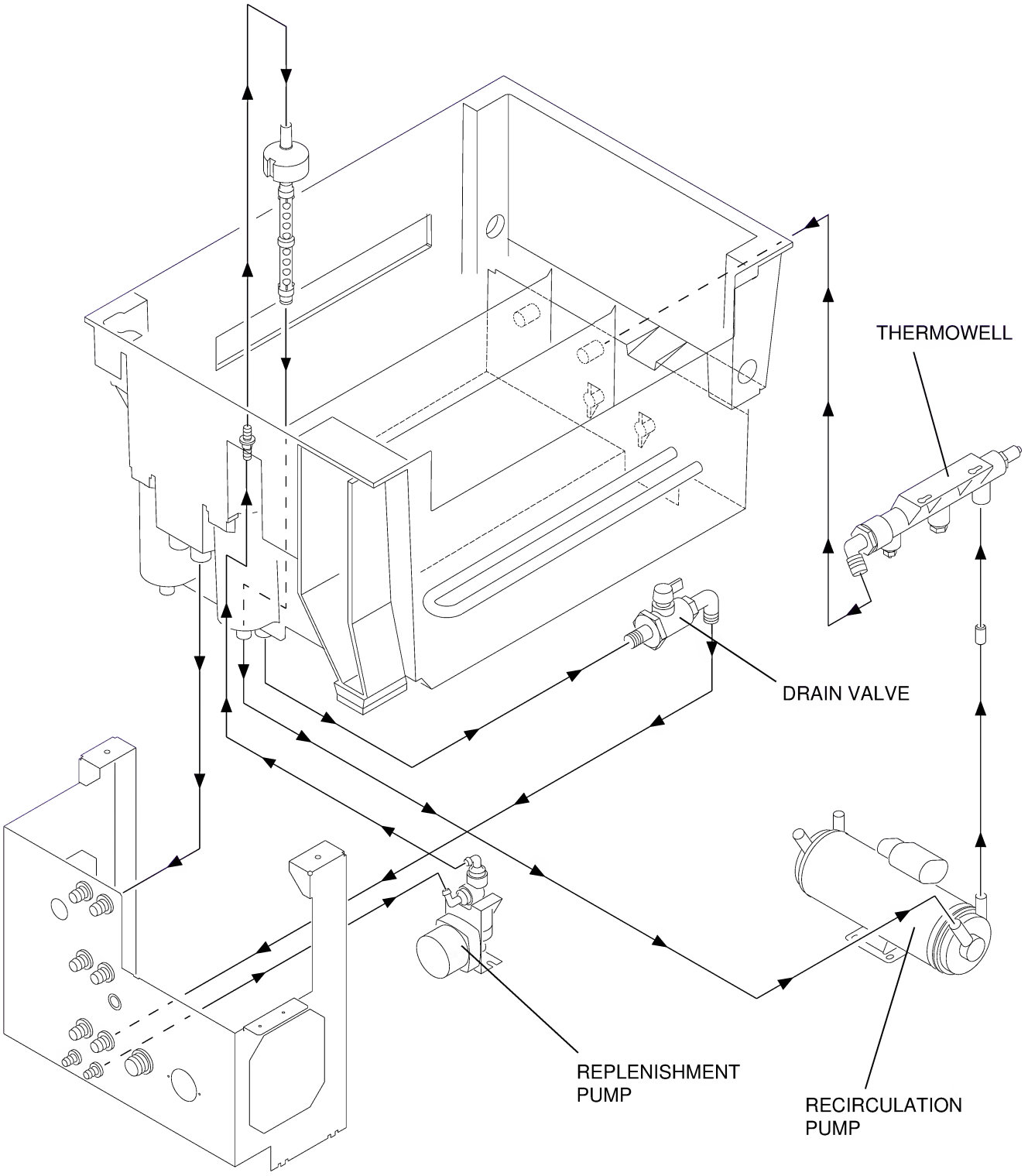
Fixer Plumbing Diagram



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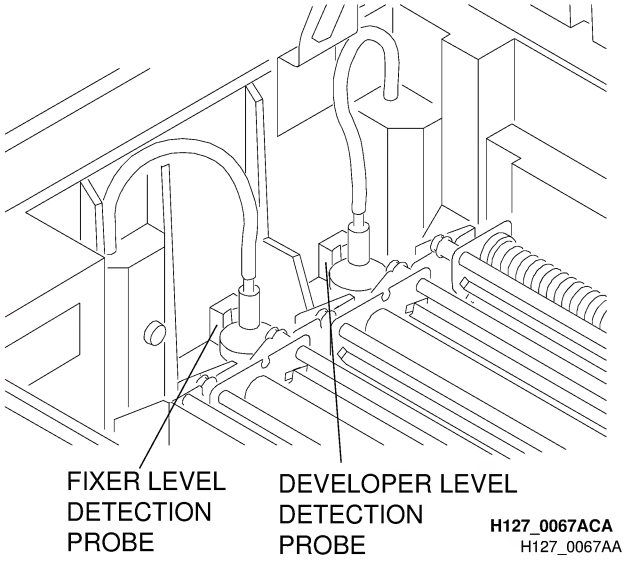
Fixer Level Detection

- If the LEVEL PROBE is not immersed in fixer solution for 10 consecutive readings (approximately 5 seconds), the solution is considered to be low.
- If the LEVEL PROBE is immersed in solution, the fixer solution is considered at the operating level.

Note

The LEVEL PROBE may not function correctly if water is in the TANK instead of fixer, because water does not have the same conductivity as the fixer solution.



Recirculation takes place only when both the FIXER and DEVELOPER TANKS are full. A PROBE in the level sensing reservoir detects a full condition. When the TANK is full, the solution covers the developer LEVEL PROBE, providing a path to ground on the fixer HEATER case., which lowers the resistance of the circuit and determines a full solution level. When the level is not high enough to cover the PROBE, the circuit has a high resistance. The MICROPROCESSOR detects the high resistance and determines a low level condition.

Fixer Recirculation Control Circuit

A diagram of the circuit appears on Page 14. For more detailed circuit information, see the AC and DC circuit diagrams in the Diagrams for the *Kodak X-Omat* 180 LP and 180 LPS PROCESSORS, Publication No. 1C7841.

Before recirculation can begin, the levels of the developer and fixer solutions in the TANKS must be high enough to immerse both the developer and fixer LEVEL PROBES in solution, providing a path to ground.

If the solution levels are correct and power is applied to the PROCESSOR, the MICROPROCESSOR energizes the recirculation RELAY K503 (and LED DS3), which provides power to the fixer RECIRCULATION PUMP, causing it to energize and recirculate the fixer.

Note

- When a RELAY is energized, the corresponding LED on the 500 CIRCUIT BOARD also energizes.
- RELAYS that are designated with a K5 (for example, K501) are electromechanical RELAYS, which are mounted on the 500 CIRCUIT BOARD. RELAYS that are designated with SSR (for example, SSR U3) are SOLID STATE RELAYS and are mounted on the wall of the ELECTRICAL BOX.

Fixer Temperature Control

Monitoring the Temperature. While the fixer solution is recirculating, a HEATER in the THERMOWELL heats the solution to increase the effectiveness of the fixer. Heating the fixer is especially important to support the faster processing cycles. Like the developer THERMOWELL, a THERMISTOR in the fixer THERMOWELL monitors the temperature of the fixer solution. The fixer HEATER is either completely on or completely off. Its duty cycle is not regulated like the developer HEATER. For more information about the control circuitry of the THERMISTOR, see Page 38.

The temperature is determined by performing an analog-to-digital (A/D) conversion on the resistance of the THERMISTOR. This data is then converted to a temperature by means of a software algorithm. The temperature is then compared to the setpoint to determine if heating is required.

The maximum temperature the A/D is able to measure is approximately 40 C (105 F). If the solution temperature is greater than 40 C (105 F), Error Code E034 “Unable to Determine Developer Temperature” is reported to the LASER PRINTER.

Heating System. The fixer, which operates more effectively at higher temperatures, does not have to be cooled. The fixer HEATER operates at full capacity when the temperature of the fixer is below the setpoint. When the temperature is above the setpoint, the HEATER is turned off.

Like the developer, the fixer solution should stabilize at the setpoint temperature within 20 minutes after energizing the PROCESSOR. If the rate of change for the fixer temperature is not within specifications, the PROCESSOR sends a message to the LASER PRINTER indicating that Error Code E039 “Loss of Fixer Heating Ability Error” has been detected.

Temperature Display. The current fixer temperature can be displayed on the DISPLAY SCREEN of the LASER PRINTER.

Temperature Control Errors. The temperature control function checks for the following errors:

- **Unable to Determine Fixer Temperature (E035)**

  If the THERMISTOR or the temperature control A/D converter is not operating correctly, or if the developer termperature is above the range of the A/D (>40 C or 105 F), an error is sent to the LASER PRINTER and displayed on the DISPLAY SCREEN of the LASER PRINTER (if it is the highest priority). This error cannot be cleared unless the PROCESSOR is de-energized and then energized again. For more information about this condition, see the THERMISTOR control section on Page 38.

- **Loss of Fixer Heating Ability (E039)**

  The heating rate of the fixer solution is checked. The minimum acceptable heating rate is an increase of 1.1 C (2.0 F) every 6 minutes. If the rate is not correct, an error message is sent to the LASER PRINTER. This error is cleared when either the rate corrects itself or the setpoint temperature is reached. The heat rate error is only checked when:
  - the fixer HEATER is on
  - the temperature of the solution is above 28.9 C (84 F)
  - the REPLENISHMENT PUMPS are not on

Fixer Temperature Control Circuit. The illustration on Page 22 shows the circuit that controls the fixer heating cycle. The fixer and developer temperature control circuits are similar, except that the fixer does not include a cooling circuit.

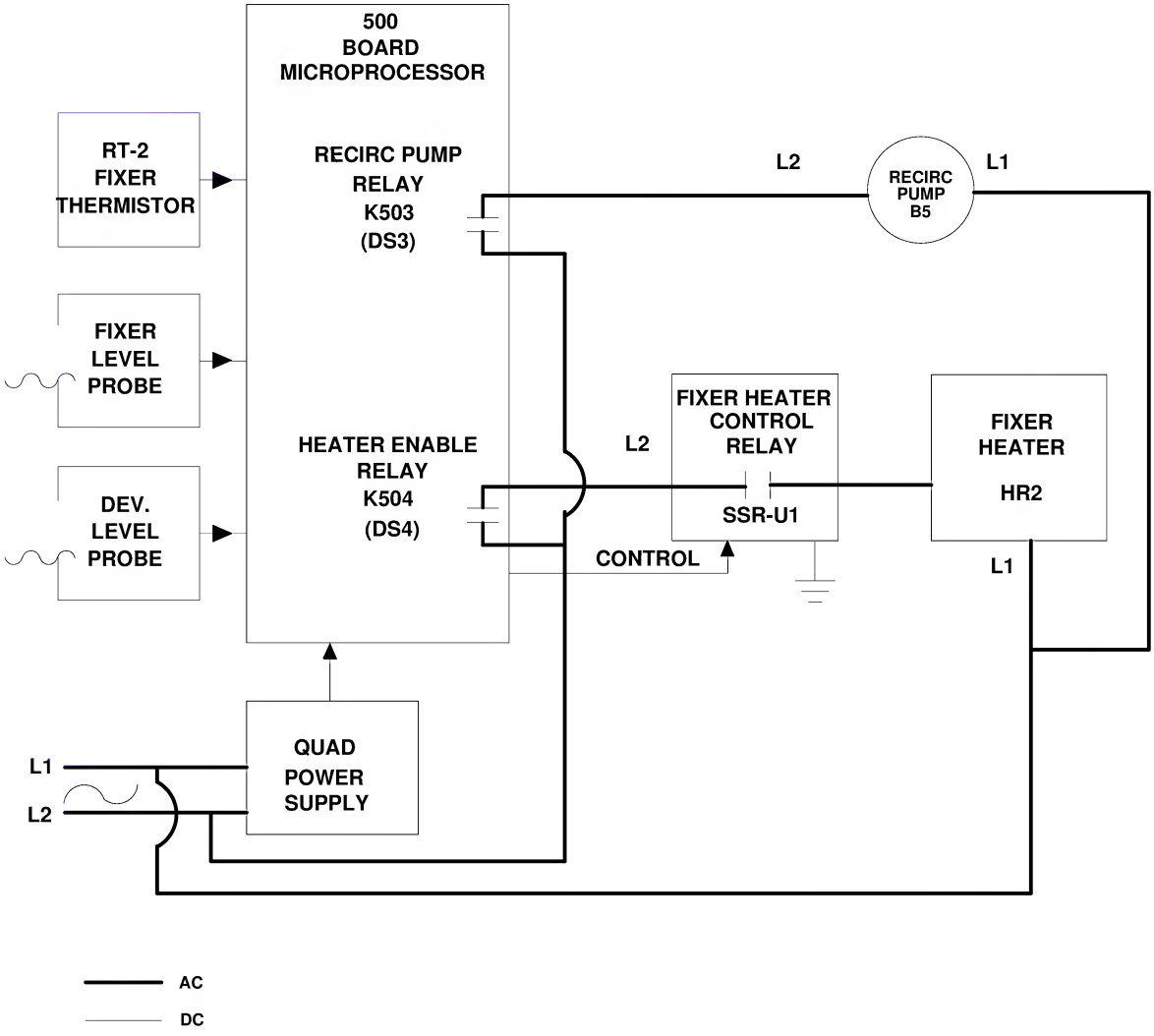
The fixer and developer TANKS must be filled before the heating circuit activates. Once the fixer LEVEL PROBE and the developer LEVEL PROBE provide a path to ground, the MICROPROCESSOR sends DC voltage to energize 2 RELAYS: K503 and K504. When RELAY K503 (LED DS3) energizes, the AC voltage activates the fixer RECIRCULATION PUMP. RELAY K504 (LED DS4), which enables the heater circuit, sends AC voltage to the SOLID STATE RELAY U1. RELAY K504 is shared with the developer temperature control circuit.

Now the MICROPROCESSOR applies DC voltage to the fixer heater SOLID STATE RELAY U1, which activates the fixer HEATER when necessary. The fixer HEATER operates continually when the fixer temperature is below the setpoint.

Note

When an enable RELAY energizes, the corresponding LED on the 500 CIRCUIT BOARD also energizes.

BLOCK DIAGRAM
FIXER TEMPERATURE CONTROL



H127_9001DC

Wash Section

After the latent image has been developed and made permanent, the film leaves the FIXER TANK and enters the WASH SECTION. The WASH RACK supplies fresh water to the film, removing all excess fixer solution from the film. This is necessary because residual chemicals causes artifacts on the film during the drying process and reduce the permanency of the image.

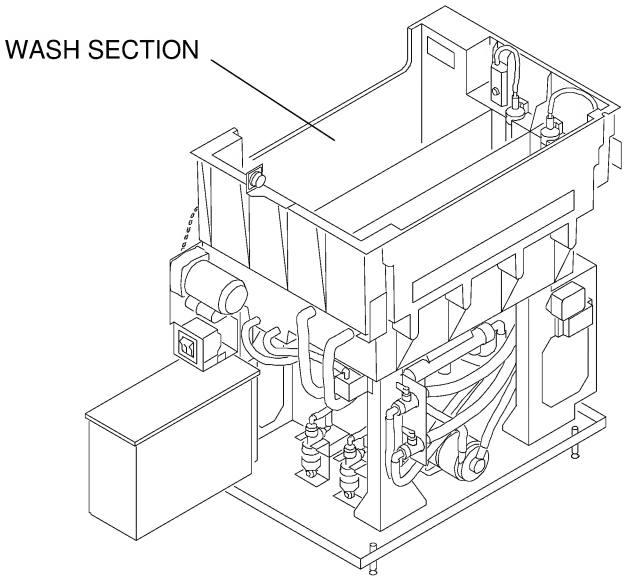
Wash water is supplied through the customer's external water supply. You'll need to add a 50-micron filter to the external water supply to remove particles. The temperature of the water must be 4 - 29 C (40 - 85 F). The water temperature must remain at least 6 C (10 F) below the operating setpoint of the developer temperature to provide proper developer cooling.

A WASH WATER SOLENOID, located in the PROCESSOR, controls the flow of water. The WASH WATER SOLENOID:

- opens when the leading edge of the film leaves the FIXER RACK. When the WASH WATER SOLENOID opens, water is supplied to the WASH RACK and CROSSOVER TROUGHS at a rate of 2.85 L (3/4 gal.) per minute, 15%.
- closes approximately 15 seconds **after** the film leaves the WASH RACK, if no additional films enter the PROCESSOR.
- opens and closes to provide water to the HEAT EXCHANGER to cool the developer.

The water flows from the WASH WATER SOLENOID, through a FLOW CONTROL VALVE and the water QUICK DISCONNECT ASSEMBLY to the WASH RACK. In the WASH RACK, the water flows into a WATER MANIFOLD, that distributes the water onto the 3 pairs of ROLLERS in the WASH RACK to wash the films. The water also flows through a YOKE SUPPLY TUBE in the WASH RACK to the WATER YOKE. The WATER YOKE supplies water to a TROUGH in the DEVELOPER/FIXER and the FIXER/WASH CROSSOVERS. The water keeps the CROSSOVER ROLLERS wet to reduce chemical deposits. If the connection at the water disconnect assembly is not correct, the water flow stops and no water enters the WASH RACK.

The WASH SECTION drains continuously to help minimize biological growth.



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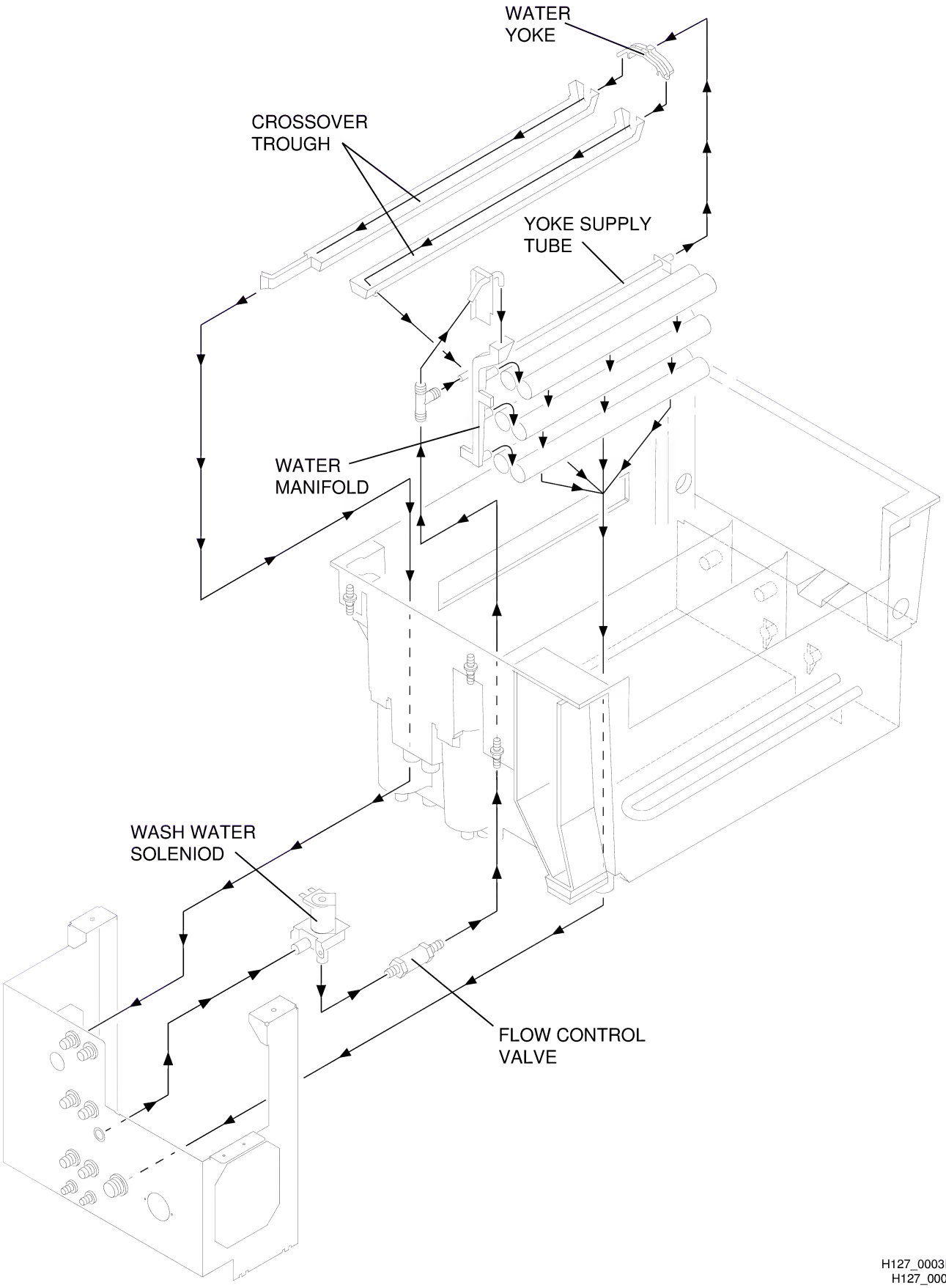
H127_0068BA

Wash Plumbing Diagram



H127_0003ECC
H127_0003EA

Water Control Circuit

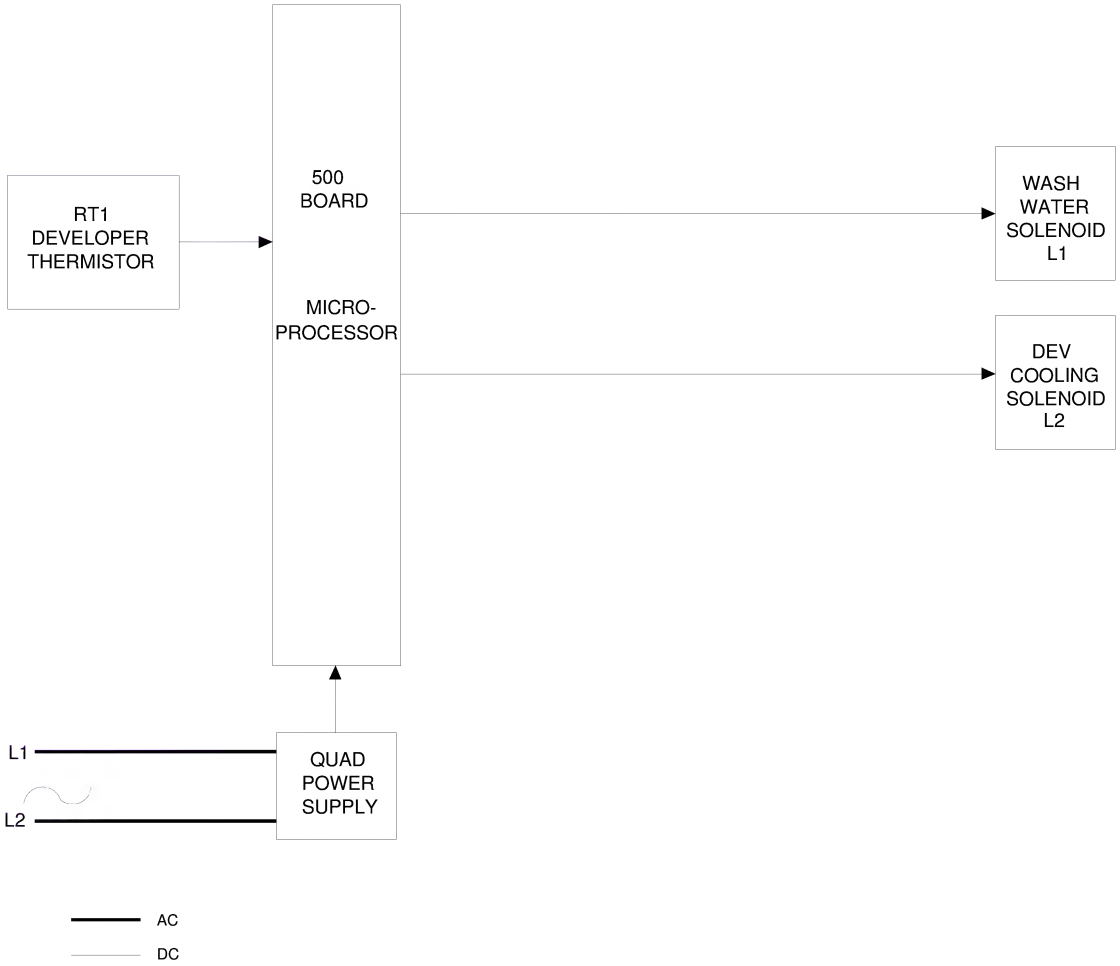
Developer Temperature Control Circuit on Page 16 includes information on this circuit. For more detailed circuit information, see the AC and DC circuit diagrams in Publication No. 1C7841.

The circuit activates when the leading edge of the film leaves the FIXER RACK. The MICRO-PROCESSOR then energizes the WASH WATER SOLENOID L1, which allows water to flow into the WASH SECTION. The SOLENOID remains energized as long as film is being processed. When no new film enters the PROCESSOR and the last film has left the WASH RACK, the MICRO-PROCESSOR de-energizes the SOLENOID and stops the water flow to the PROCESSOR.

When the developer THERMISTOR detects a developer temperature 0.17 C (0.3 F) higher than the setpoint, the MICROPROCESSOR energizes the DEVELOPER COOLING SOLENOID L2 and the WASH WATER SOLENOID L1. The DEVELOPER COOLING SOLENOID opens the path to the HEAT EXCHANGER, allowing developer to enter the HEAT EXCHANGER at the bottom of the WASH SECTION. The wash water cools the HEAT EXCHANGER and thereby cools the developer.

Once the developer THERMISTOR detects a temperature below the setpoint, the MICRO-PROCESSOR de-energizes the DEVELOPER COOLING SOLENOID L2, which stops the developer flow through the HEAT EXCHANGER. If the PROCESSOR is in the standby mode, the WASH WATER SOLENOID de-energizes also. In the operating mode, however, the WASH WATER SOLENOID remains energized.

BLOCK DIAGRAM
WATER CONTROL



H104_9014DC

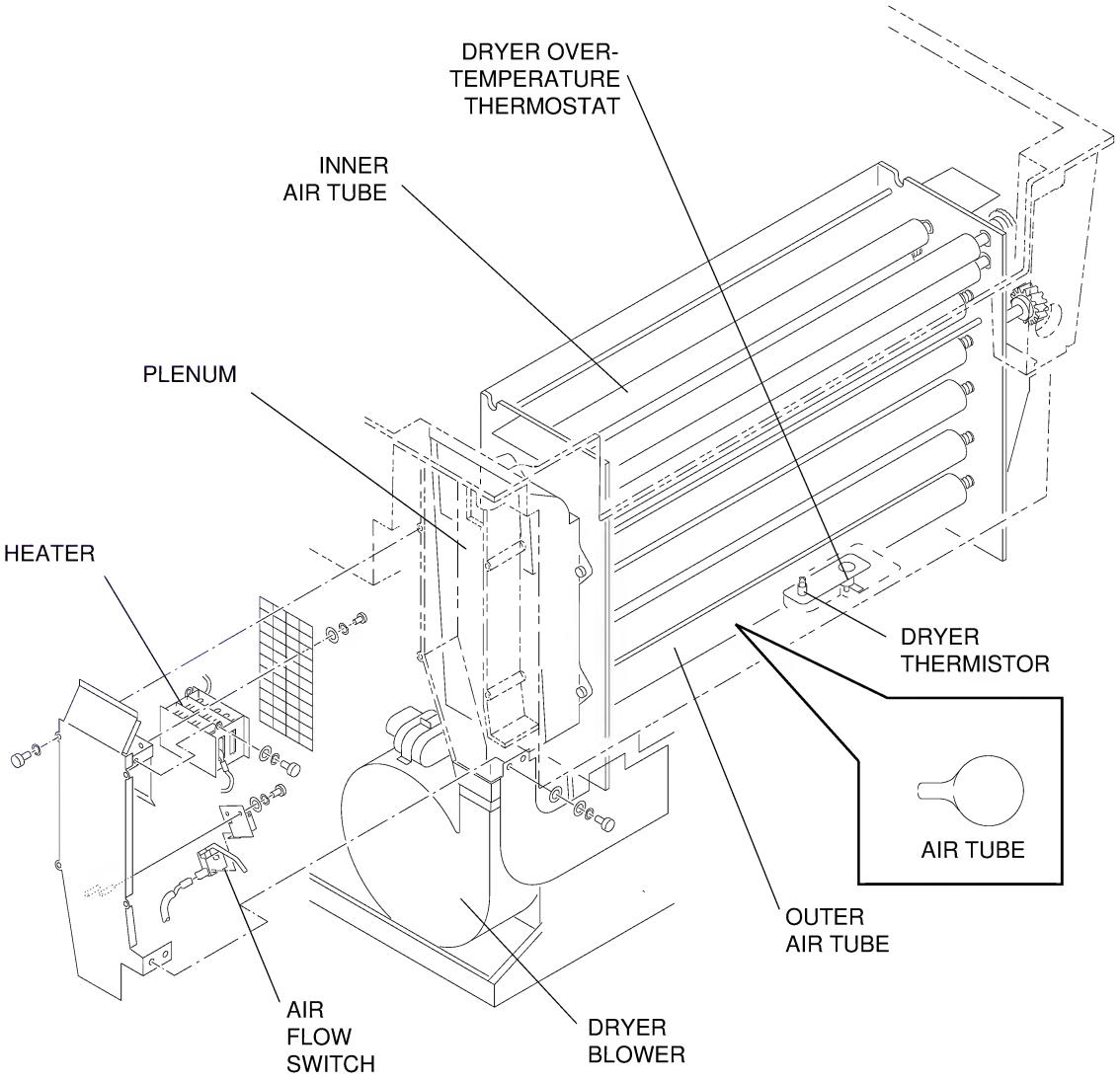
DRYER

As the film leaves the WASH SECTION, it passes into the DRYER where, SQUEEGEE ROLLERS remove most of the water across the film surface to allow for faster drying time and eliminate water spots.

The film then enters the vertical transport of the DRYER, where INNER and OUTER AIR TUBES circulate hot air across the film. The AIR TUBES are located on both sides of the DRYER to dry both sides of the film at the same time.

The DRYER BLOWER motor provides the air supply for the AIR TUBES. The BLOWER energizes when the PROCESSOR is taken out of standby mode. A DRYER HEATER heats the air to a temperature within 38 - 65 C (100 - 150 F). The temperature in the DRYER is sensed by a THERMISTOR, and can be adjusted in 1.0 C (1.0 F) increments through the CONTROL PANEL on the LASER PRINTER. For more information about the operation of the DRYER THERMISTOR, see Page 38.

The PROCESSOR has an OVERTEMPERATURE THERMOSTAT. If the temperature becomes excessive, the OVERTEMPERATURE THERMOSTAT shuts off the DRYER HEATER. The THERMOSTAT must be manually reset before the HEATER can operate again.



H104_0474DCA
H104_0474DA

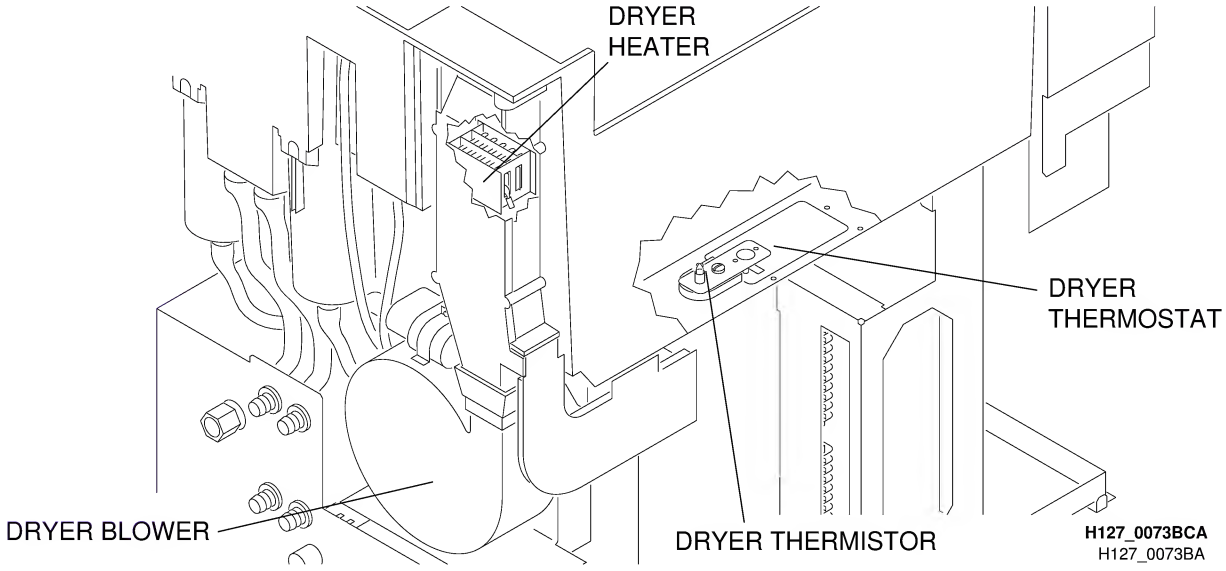
Dryer Temperature Control

The temperature of the air is determined by converting the resistance of the DRYER THERMISTOR into temperature. This value is then compared to the setpoint.

The DRYER BLOWER and HEATER cycles on and off while in the standby mode. The DRYER BLOWER and HEATER remain off for 45 seconds. Then the BLOWER energizes and 5 seconds later, the temperature is checked. If the temperature is below the setpoint, the HEATER energizes and stays on until the setpoint is reached. Once the setpoint is reached, the HEATER and BLOWER de-energize and the cycle is repeated. The HEATER operates at different cycles, depending on the difference between the setpoint and the detected temperature. The HEATER stays on full when the temperature is more than 0.6 C (1 F) below the setpoint. If the temperature of the DRYER is less than 0.6 C (1 F) below the setpoint, the DRYER HEATER cycles with a 25% duty cycle.

During normal operation (when the PROCESSOR is not in standby mode), the DRYER BLOWER runs continuously.

The dryer temperature and dryer temperature setpoint are available on the DISPLAY SCREEN of the LASER PRINTER. The dryer temperature setpoint can be changed from the CONTROL PANEL on the LASER PRINTER in increments of 1 C (or 1 F).



Temperature Control Errors

The temperature control function checks for the following errors:

- **Dryer Overtemperature Data Error (E002)**

  If the MICROPROCESSOR determines that the dryer temperature exceeds 74 C (165 F), an overtemperature condition exists. The PROCESSOR sends a message to the LASER PRINTER indicating that an error has been detected and the PROCESSOR shuts down after the last film exits.

- **Loss of Dryer Airflow / Dryer Overtemperature Thermostat (E005)**

  The PROCESSOR sends a message to the LASER PRINTER if either of the following conditions occur:

  the dryer airflow is not sufficient or

  the dryer temperature exceeds approximately 74 C (165 F) and the OVER-TEMPERATURE THERMOSTAT opens

- **Unable to Determine Dryer Temperature (E036)**

  If the THERMISTOR or the temperature control A/D converter is not operating correctly, the PROCESSOR sends a message to the LASER PRINTER indicating that an error has been detected and the error is displayed on the LASER PRINTER (if it is the highest priority error). The error cannot be cleared unless the PROCESSOR is de-energized and then energized again. For more information about this condition, see the THERMISTOR control section on Page 38.

- **Inoperative Dryer Error (E040)**

  The rate at which the air in the dryer is heated is checked. The minimum acceptable heating rate is an increase of 0.28 C (0.5 F) every 2 minutes. If the rate is not correct, the PROCESSOR sends a message to the LASER PRINTER indicating that an error has been detected and the error is displayed on the LASER PRINTER (if it is the highest priority error).

  The heat rate error is only checked when:
  - the DRYER HEATER is operating
  - film is not present in the PROCESSOR
  - after initialization is completed

- **Dryer Under Setpoint Temperature Warning (E134)**

  If the dryer setpoint temperature is changed to a higher value, the PROCESSOR sends a message to the LASER PRINTER indicating that an E134 error has been detected and the warning message is displayed on the LASER PRINTER until the new setpoint is reached.

Dryer Temperature Control Circuit

Note

- When a RELAY is energized, the corresponding LED on the 500 CIRCUIT BOARD also energizes.
- RELAYS that are designated with a K5 (for example, K501) are electromechanical RELAYS, which are mounted on the 500 CIRCUIT BOARD. RELAYS that are designated with SSR (for example, SSR U3) are SOLID STATE RELAYS and are mounted on the wall of the ELECTRICAL BOX.
- For more detailed dryer circuit information, see the AC and DC circuit diagrams in the Diagrams for the *Kodak X-Omat* 180 LP and 180 LPS PROCESSORS, Publication No. 1C7841.

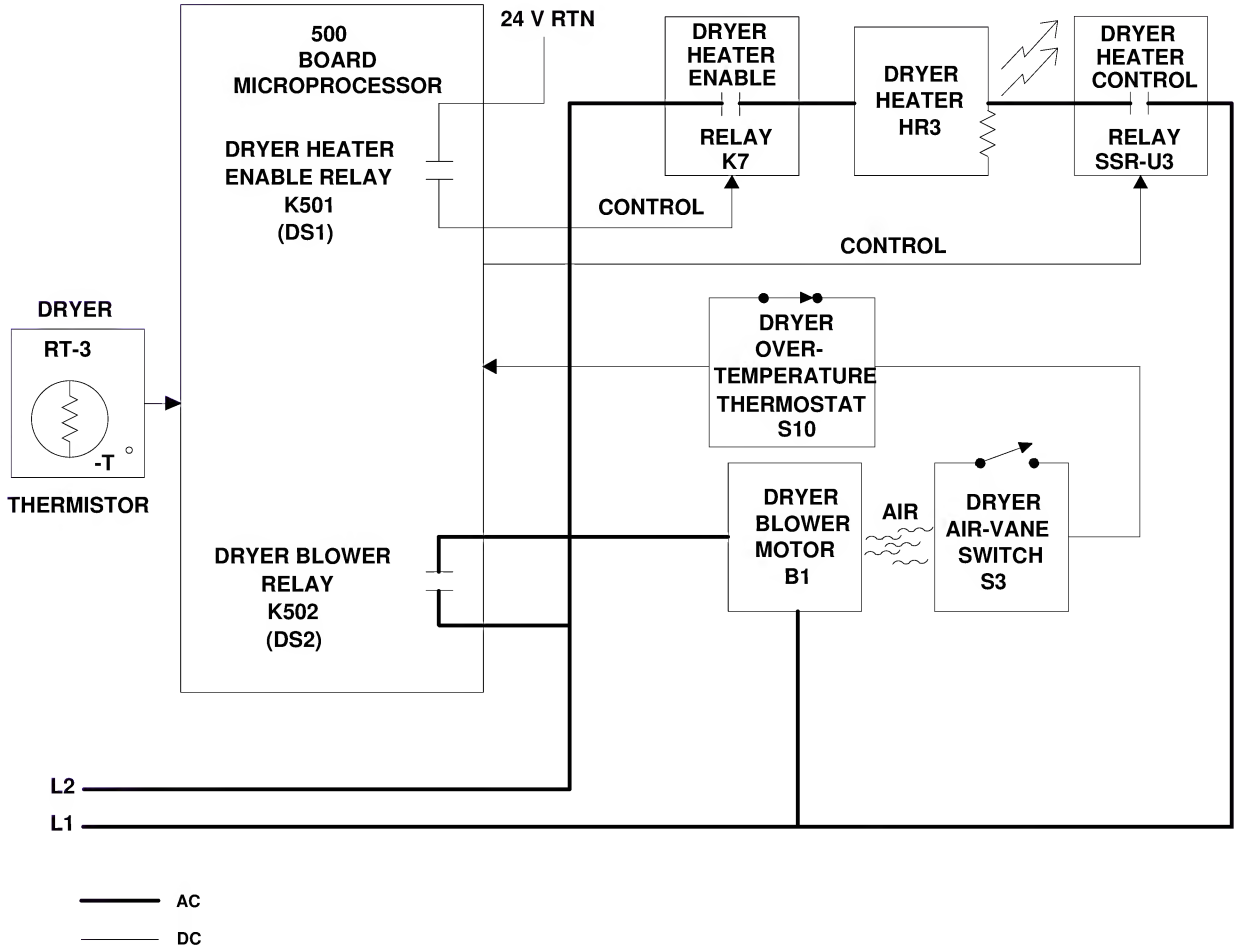
When the PROCESSOR leaves standby mode, the following events occur:

- RELAY K502 is energized, turning on the DRYER BLOWER.
- The DRYER BLOWER creates air flow which actuates the AIR FLOW SWITCH S3.
- The actuation of the AIR FLOW SWITCH in combination with a signal from the MICROPROCESSOR energizes the DRYER HEATER enable RELAY K501.
- RELAY K501 energizes RELAY K7, which enables the DRYER HEATER (HR3).

The MICROPROCESSOR now reacts to the temperature input that is received from the DRYER THERMISTOR. If the dryer temperature is below the setpoint, the MICROPROCESSOR applies DC voltage to the dryer heater control RELAY U3. When the relay energizes, the DRYER HEATER turns on. The DRYER HEATER operates continually, but at different duty cycles, depending on the difference between the detected temperature and the setpoint. The HEATER stays on full when the temperature is more than 0.6 C (1 F) below the setpoint. If the temperature of the DRYER is less than 0.6 C (1 F) below the setpoint, the DRYER HEATER cycles on and off with a 90% duty cycle. If the termperature of the DRYER is less than 0.6 C (1 F) above the setpoint, the DRYER HEATER will cycle with a 25% duty cycle. The DRYER BLOWER operates continuously, as long as the PROCESSOR is not in standby mode.

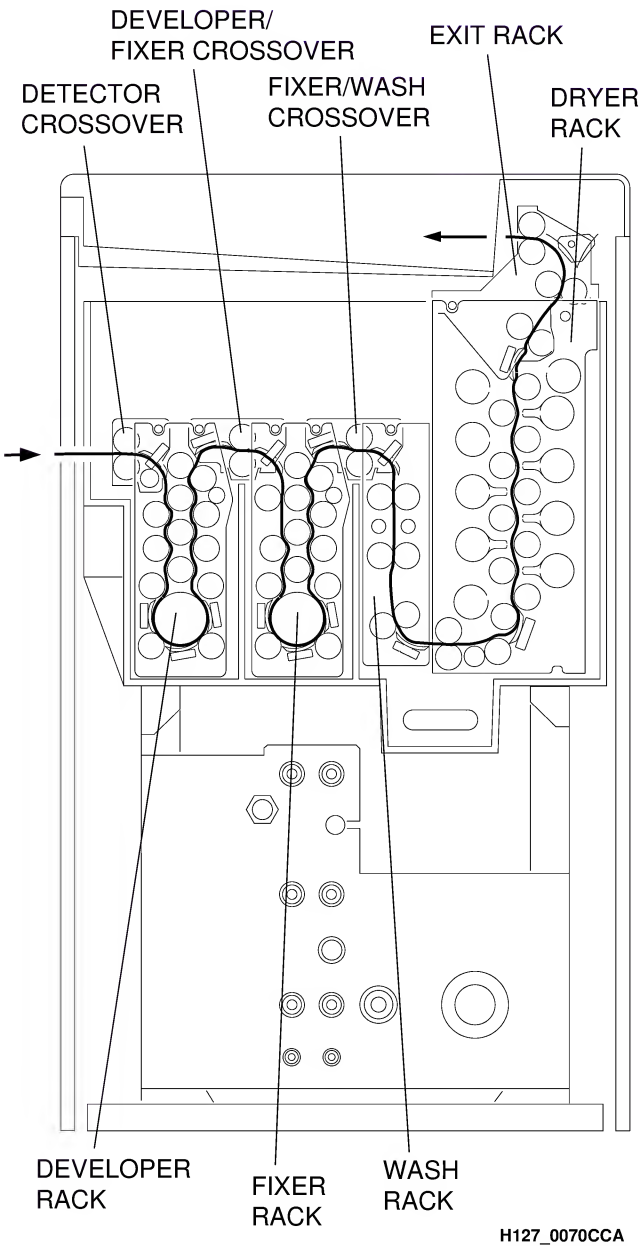
A DRYER OVERTEMPERATURE THERMOSTAT S10 located in the dryer section of the PROCESSOR protects the PROCESSOR in case the DRYER HEATER circuit malfunctions. The OVERTEMPERATURE THERMOSTAT is wired in series with the dryer AIR FLOW SWITCH. If the dryer temperature exceeds approximately 74 C (165 F), the DRYER OVERTEMPERATURE THERMOSTAT electrically opens and de-energizes RELAY K501, which in turn de-energizes RELAY K7 and turn the DRYER HEATER off.

BLOCK DIAGRAM
DRYER TEMPERATURE CONTROL



H127_9002DC

EXIT RACK



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H127_0070CA

As the film leaves the DRYER, it passes into the EXIT RACK. A film exit sensor sends a message to the LASER PRINTER, telling the system that the film has exited the PROCESSOR.

Standby Mode

If no new film enters the PROCESSOR, the PROCESSOR enters the standby mode approximately 15 seconds after the last film has exited or the PROCESSOR has received a standby command from the LASER PRINTER.

The following events occur when the PROCESSOR enters the standby mode:

1. The DRIVE MOTOR de-energizes.
2. The water supply, unless needed for developer cooling, is turned off.
3. The developer and fixer temperatures are maintained at the setpoint.
4. The dryer temperature is maintained at the setpoint. The DRYER HEATER and BLOWER cycles on and off. During each cycle, the BLOWER activates and the dryer temperature is read. If the temperature is below the setpoint, the HEATER is turned on until the temperature reaches the setpoint. The HEATER and BLOWER then turn off and remain off for 45 seconds, then the cycle repeats.

The DRIVE MOTOR operates for 90 seconds after every 8 minutes of PROCESSOR inactivity to allow wetting of the CROSSOVER REWET ROLLERS. The following actions occur:

1. The DRIVE MOTOR turns on.
2. The wash water turns on.
3. The 90-second timer begins. When the 90-second timer expires:
   a. the DRIVE MOTOR de-energizes
   b. the wash water shuts off
   c. the 8-minute standby timer begins
4. After 8 minutes, the cycle repeats

The PROCESSOR automatically exits standby mode and enters the operating mode when instructed by the LASER PRINTER.

Note

The PROCESSOR returns to standby unless film is present.

Section 5: Replenishment

Overview

As film travels through the PROCESSOR, it absorbs the chemicals in the developer and fixer, which results in a depletion of chemicals in the TANKS. New chemicals, therefore, must be added periodically to maintain an effective level of chemical activity.

In the 180 LP and 180 LPS PROCESSORS, new developer and fixer solutions are replenished automatically to maintain the correct chemical activity and level of solutions in each TANK. Two PUMPS, one for developer and one for fixer, pump new solutions from external containers that are connected to the PROCESSOR. The new solutions are pumped directly into the DEVELOPER and FIXER TANKS where they enter the recirculation system.

Note

Replenishment volumes are preset at the factory, but these values can be changed through the CONTROL PANEL on the LASER PRINTER.

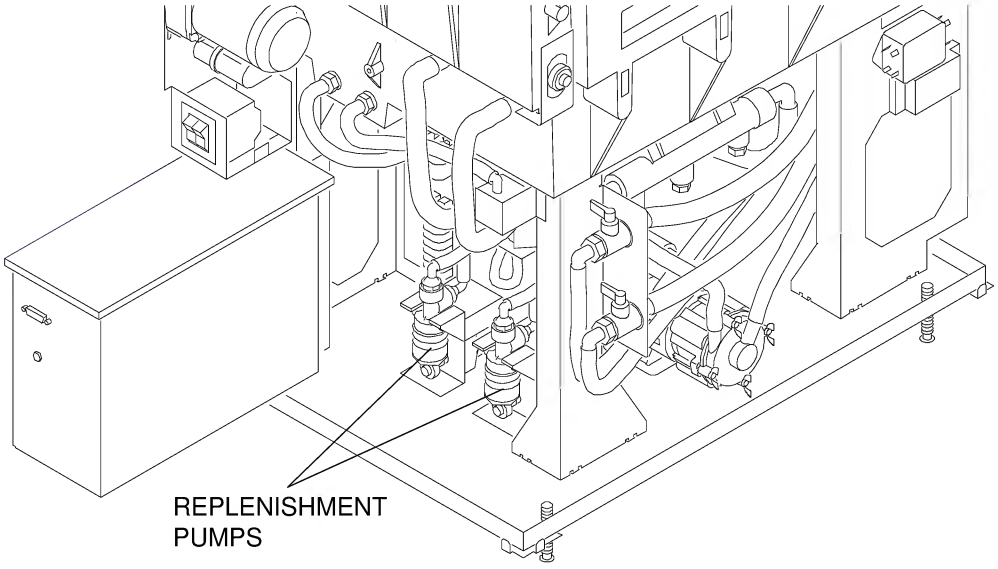
The REPLENISHMENT PUMPS can be disabled to allow maintenance of the PROCESSOR by either of 2 methods:

- **Lifting the TOP COVER of the PROCESSOR (if the PROCESSOR has no SORTER)**

  This action disables the REPLENISHMENT PUMPS and the PROCESSOR sends a message to the LASER PRINTER indicating that an E128 error has been detected. The LASER PRINTER displays Error Code E128.

- **Disabling the replenishment function**

  The REPLENISHMENT PUMPS can be disabled through the menus on the LASER PRINTER. The PROCESSOR sends a message to the LASER PRINTER indicating that an E130 error has been detected. The LASER PRINTER displays the error when the PUMPS are disabled using this function.



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H127_0066BA

Replenishment Modes

The PROCESSOR offers 2 types of replenishment, which can be selected by the operator through the CONTROL PANEL of the LASER PRINTER. Both replenishment modes use the film area information from the LASER PRINTER to calculate replenishment needs.

Auto Replenishment Mode is the standard replenishment mode of the PROCESSOR. In this mode, replenishment occurs under 2 conditions:

- The replenishment cycle is activated each time approximately 1500 sq cm (238 sq in.) of film have been processed, which is equivalent to one 35 x 43 cm (14 x 17 in.) sheet of film. The operator can adjust the amount of replenishment that is added for each 1500 sq cm (238 sq in.) of processed film within a certain range. The default amounts are 65 mL of developer and 65 mL of fixer.
- The PROCESSOR also replenishes to compensate for low film usage as follows:

  Low-volume applications are those PROCESSORS that process less than 75 sheets of film in 24 hours (for continuous-run applications) or more than 2 start-up cycles (where the last cycle is more than 3.5 hours). A low-volume application is further broken down, and different replenishment volumes are added accordingly for correct control:

Sheets on Current Film Count	Replenishment Added over 4 Hours
less than 55 sheets	1 litre (125 mL / 1/2 hour)
56 - 65 sheets	750 mL (93 mL / 1/2 hour)
66 - 74 sheets	400 mL (50 mL / 1/2 hour)

Note

The REPLENISHMENT PUMPS automatically actuatae every half hour during the 4-hour period when extra replenishment is added. This is normal operating procedure.

The Flooded Replenishment Mode activates the REPLENISHMENT PUMPS to add a predetermined volume of developer and fixer after every 5 minutes of operation and after approximately 1500 sq cm (238 sq in.) of film have been processed. The amount of solution added to the TANKS is predetermined in the software; the operator can adjust the amount within a certain range. The flooded replenishment mode is intended for use in low-volume applications where 25 or fewer 35 x 43 cm (14 x 17 in.) films are processed per day.

Replenishment Calculation

The “on-time” of the pumps is calculated by dividing the flooded replenishment volume, which is stored in memory, by the REPLENISHMENT PUMP flow rate.

Filling the Developer and Fixer Tanks

Solutions are also added to fill the TANKS when necessary in one of two ways. Which one occurs depends on the situation.

- **Raising the Solution Level**

  When a low solution level is detected either during PROCESSOR initialization, normal operation, or standby mode, the fixer or developer REPLENISHMENT PUMP is energized and solution is added to that TANK. If the solution level is not correct within 4 minutes, a tank-fill error occurs.

- **Tank-Fill Mode**

  This method is used to fill an empty TANK, such as at PROCESSOR installation or after performing periodic maintenance.

  The tank-fill operation is activated through the CONTROL PANEL. When “Tank Fill” is selected, the HEATERS, BLOWER and DRIVE MOTOR are disabled, and the appropriate REPLENISHMENT PUMP activates. Error code E129 is sent to the LASER PRINTER and displayed on the DISPLAY SCREEN while the tank-fill operation is in progress.

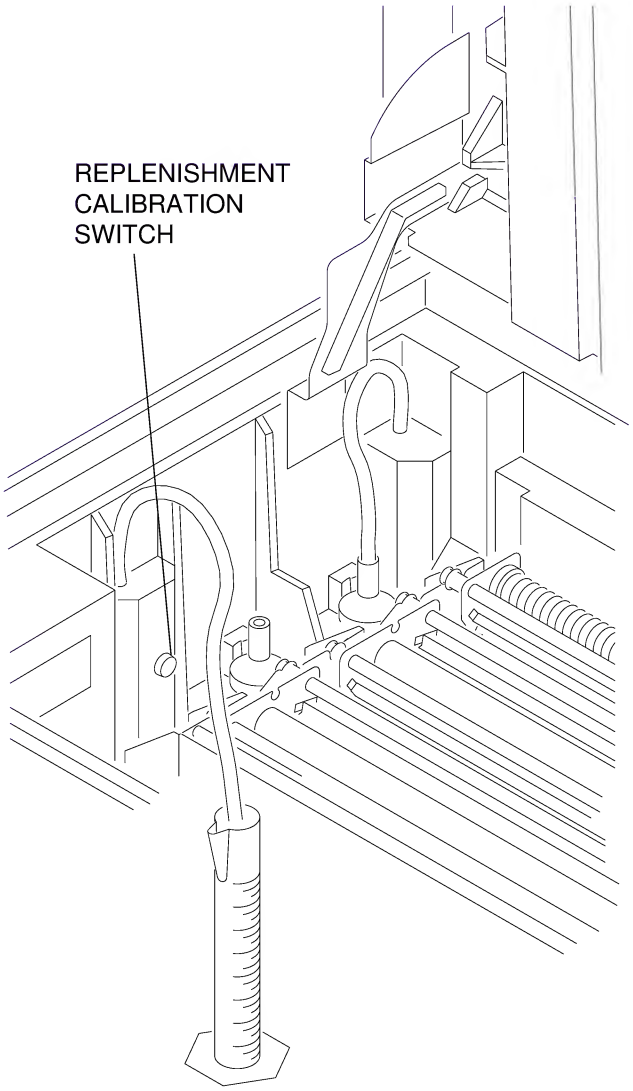
  The solution levels are checked constantly during the tank-fill operation. When the LEVEL PROBE detects the correct solution level, the tank-fill mode is disabled, the REPLENISHMENT PUMP de-energizes, the Error Code E129 is removed; and the HEATERS, BLOWER, and DRIVE MOTOR are enabled. If both TANKS are not filled within 15 minutes, the PUMP or PUMPS de-energize and a tank-fill error is displayed.

Replenishment Errors

The replenishment control checks for the following errors:

Developer Tank Fill Replenishment Error (E032)
Fixer Tank Fill Replenishment Error (E033)

These errors occur when the developer and fixer solutions do not reach the correct level within the allowed time limit (4 minutes when topping off the TANKS, and 15 minutes during tank-fill). If a developer or fixer tank fill error occurs, a message is displayed (if it is the highest priority error).



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H127_0072CA

Calibration of the Replenishment Pumps

The MICROPROCESSOR calibrates the flow of replenisher through the REPLENISHMENT PUMPS. The operator or service person enables this function through the DISPLAY SCREEN on the LASER PRINTER or through the diagnostics on the PORTABLE COMPUTER. The REPLENISHMENT CALIBRATION SWITCH, that is on the inside of the processing TANK, must be pressed and released to activate the selected REPLENISHMENT PUMP. The PUMP operates for a fixed time, approximately 5 seconds.

The operator then measures the volume of solution and compares it to the volume of solution that the DISPLAY SCREEN displayed. If the 2 volumes are the same, the REPLENISHMENT PUMP is calibrated correctly. If the 2 are not the same, the operator must enter the amount of solution collected into the DISPLAY SCREEN. The software then recalculates the actual flow rate of the PUMP.

Note

The volume measured during the calibration procedure is not the same as the replenishment volume added to the TANK for a 35 x 43 cm (14 x 17 in.) film.

Replenishment Control Circuit

The control circuit on the next page includes all the components mentioned earlier that activate the replenishment system. (For more detailed circuit information, see the AC and DC circuit diagrams in the Diagrams for the *Kodak X-Omat* 180 LP and 180 LPS PROCESSORS, Publication No. 1C7841.) Like many other functions in the PROCESSOR, the INTERLOCK SWITCH for the TOP COVER of the PROCESSOR must be actuated to enable the replenishment circuit, except during replenishment calibration

If the calibration mode has been selected (through the CONTROL PANEL of the LASER PRINTER) and the replenishment calibration switch is actuated, the MICROPROCESSOR activates the replenishment circuit. .

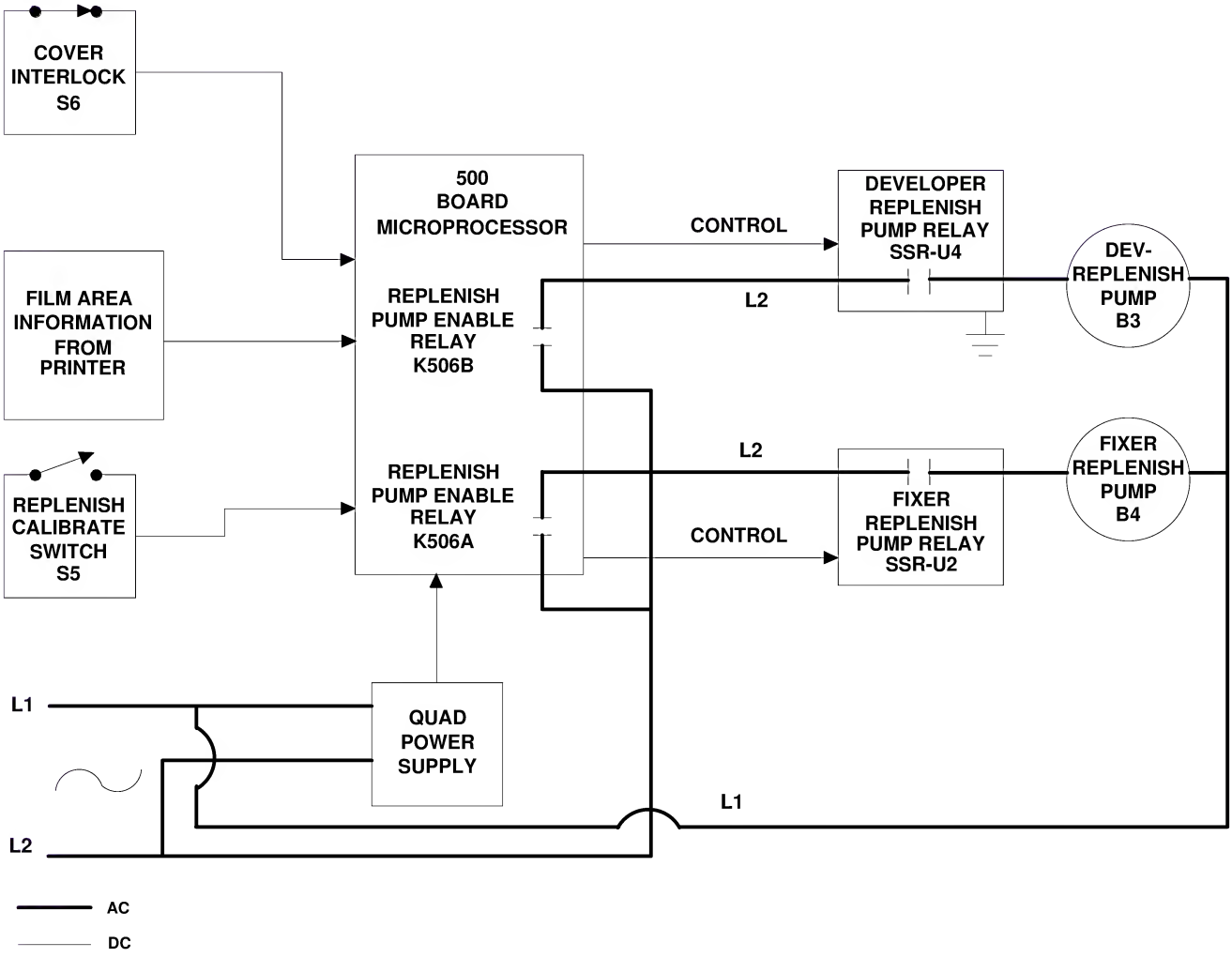
After the INTERLOCK SWITCH is actuated, one of the following activates the replenishment circuit:

- The operator uses the CONTROL PANEL of the LASER PRINTER to tell the MICROPROCESSOR that flooded replenishment mode, tank-fill mode, or calibration mode has been selected. The MICROPROCESSOR then activates the replenishment circuit when appropriate.
- Holding the REPLENISHMENT CALIBRATION SWITCH for 5 seconds while the PROCESSOR is in normal standby mode, causes the REPLENISHMENT PUMPS to deliver an amount equivalent to what it delivers for a 35 sq cm (14 x 17 in.) sheet of film. This method is used as a quick check of the replenishment calibration.
- Anytime that the LEVEL PROBES indicate low developer or fixer levels, the replenishment circuit activates.

To activate the replenishment circuit, the MICROPROCESSOR energizes the replenishment enable RELAY K506. After K506 is energized, the MICROPROCESSOR sends DC voltage to the developer and fixer replenishment pumps SOLID STATE RELAYS U2 and U4. The RELAYS energize, the pumps activate, and the replenishment begins.

When the MICROPROCESSOR determines that the appropriate amount of solution has been replenished, it removes the DC voltage to the SOLID STATE RELAYS and then de-energizes enable RELAY K506 to turn the PUMPS off.

BLOCK DIAGRAM
DEVELOPER/FIXER REPLENISHMENT CONTROL



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Section 6: THERMISTORS and Temperature Measuring

THERMISTOR Error Detection

The MICROPROCESSOR 500 CIRCUIT BOARD performs an analog to digital (A/D) conversion on the resistance of the THERMISTOR to determine the temperature of the solutions and the dryer. This data is then converted to a temperature by means of a software algorithm.

The PROCESSOR checks for 2 different malfunctions with the temperature circuit: wrong A/D temperature conversions, and faulty THERMISTORS. If one of these malfunctions occurs, the PROCESSOR sends a message to the LASER PRINTER indicating that an error has been detected.

E034 Unable to Determine Developer Temperature
E035 Unable to Determine Fixer Temperature
E036 Unable to Determine Dryer Temperature

The A/D temperature conversions are checked by reading a precision resistor (instead of the THERMISTOR) every $^{3}/_{4}$ second. If the A/D reads the precision resistor incorrectly for 5 consecutive readings, the A/D is considered to be inoperative.

If the A/D reading of the THERMISTORS is outside of the allowed range for 5 consecutive readings, the THERMISTOR is considered to be inoperative. This could also be caused by the solution temperature being above 40 C (105 F). Temperatures above 40 C (105 F) are out of range of the A/D.

These checks are not performed until $5^{1}/_{2}$ minutes after energizing the PROCESSOR. This delay prevents Open Thermistor errors due to cold solution temperatures or a cold room ambient temperature.

Section 7: Displays and Control

DISPLAY SCREEN

The DISPLAY SCREEN for the 2180 LASER PRINTER also provides information about the 180 LP or 180 LPS PROCESSOR. There is no operator CONTROL PANEL or DISPLAY SCREEN on the 180 LP or 180 LPS PROCESSOR; operator communications are conducted using the DISPLAY SCREEN on the LASER PRINTER.

The following information for the PROCESSOR is available on the LASER PRINTER menus displayed on the CONTROL PANEL of the LASER PRINTER:

- PROCESSOR Status
- Developer Temperature
- Fixer Temperature
- Dryer Temperature
- Errors
- Replenishment Mode
- Replenishment Volumes

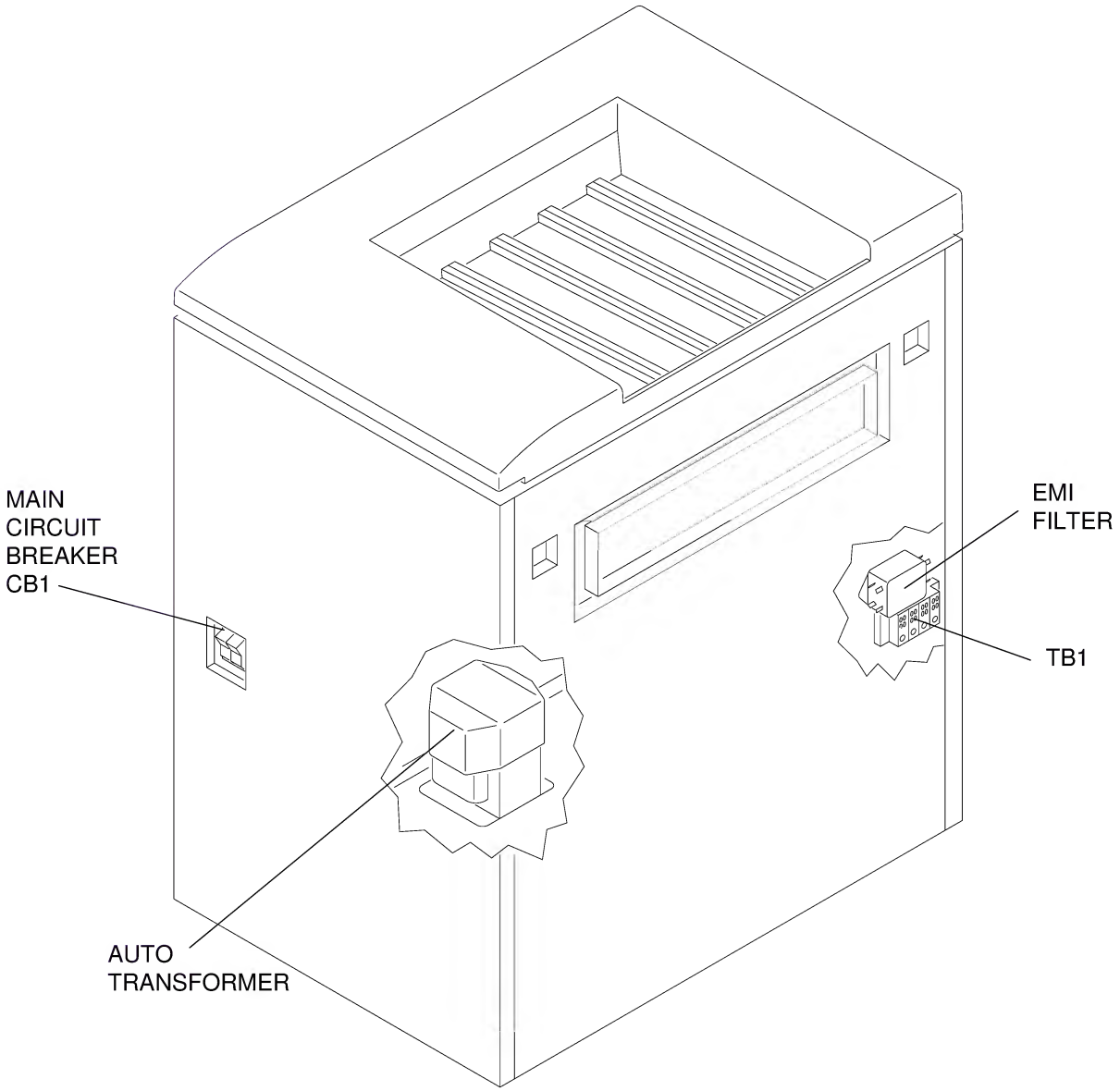
Section 8: Power Distribution and Control

AC Distribution

The PROCESSOR runs on various AC service options. The 2180 Site Specifications publication provides a complete list of all of the various power configurations that are available for the 180 LP and 180 LPS PROCESSORS.

The PROCESSOR uses AC power to operate all MOTORS and HEATERS. AC power also supplies the QUAD POWER SUPPLY, which converts the power into 4 DC voltages.

When the power enters the PROCESSOR, it first enters TERMINAL BLOCK TB1. From there it is directed to an EMI FILTER, then to the MAIN CIRCUIT BREAKER CB1, and then to an AUTOTRANSFORMER. The AUTOTRANSFORMER increases or decreases the incoming voltage.



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DC Distribution

The QUAD POWER SUPPLY supplies the DC voltages used in the PROCESSOR by converting the incoming AC voltage into +5, +12, -12, and +24 V DC. This voltage is distributed to the 500 CIRCUIT BOARD.

SOLID STATE RELAYS (+5 V DC)

The PROCESSOR uses 5 SOLID STATE RELAYS to control the following components:

- SSR-U5 - DEVELOPER HEATER
- SSR-U4 - DEVELOPER REPLENISHMENT PUMP
- SSR-U3 - DRYER HEATER
- SSR-U2 - FIXER REPLENISHMENT PUMP
- SSR-U1 - FIXER HEATER

Electromechanical RELAYS (+24 V DC)

The PROCESSOR uses 7 electromechanical RELAYS to control the following components:

- K501 - DRYER HEATER ENABLE - LED 1
- K502 - DRYER BLOWER - LED 2
- K503 - RECIRCULATION PUMP - LED 3
- K504 - DEVELOPER AND FIXER HEATERS ENABLE - LED 4
- K505 - DRIVE MOTOR - LED 5
- K506 - REPLENISHMENT PUMP ENABLE - LED 6
- K7 - DRYER HEATER ENABLE RELAY

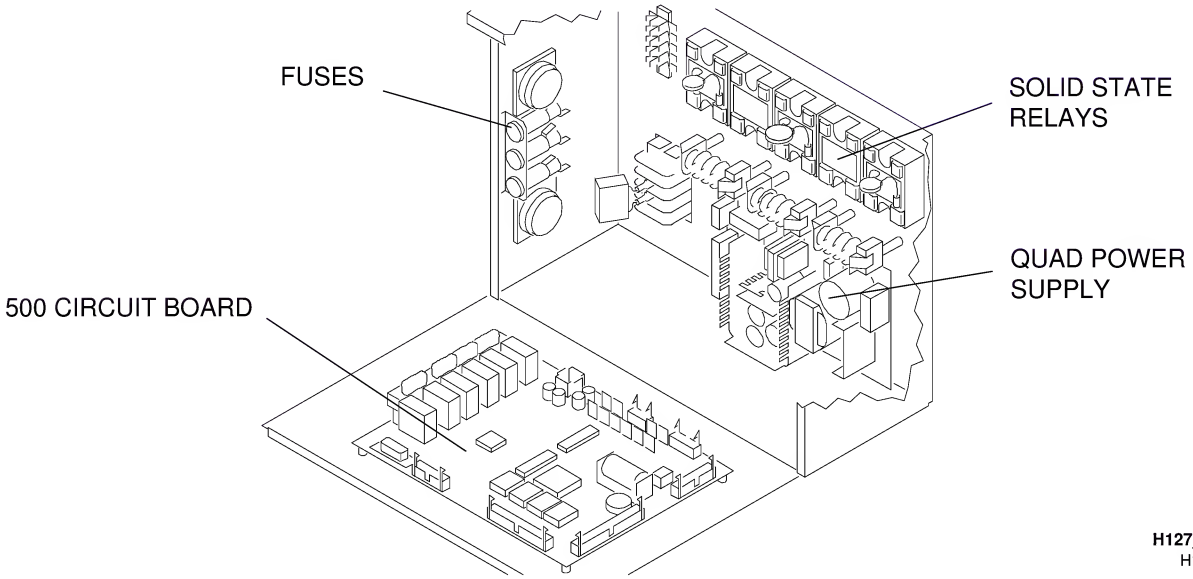
In some instances, the PROCESSOR uses the electromechanical RELAYS as enable RELAYS, and the SOLID STATE RELAYS as control RELAYS. For example, the developer HEATER is enabled by the K504, but the SSR-U5 actually controls the developer temperature.

For more detailed circuit information, see the DC circuit diagrams in the Diagrams for the *Kodak X-Omat* 180 LP and 180 LPS PROCESSORS, Publication No. 1C7841.

ELECTRICAL BOX

The ELECTRICAL BOX contains the following components:

- POWER SUPPLY
- 500 MICROPROCESSOR CIRCUIT BOARD
- SOLID STATE RELAYS
- Mechanical RELAY
- FUSES
- EMI Suppression Devices



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Section 9: Publication History

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